ISBN: 978-1-7369640-4-0

Estd. in 2001

MCU 2021 Invention & Innovation

Proceedings of
International Conference on Trends in Electronics & Communication - 2021

IC-TELCON - 2021

Organized by: **Department of Electronics Telecommunication & Electronics Engineering**

Editors

Dr. Payel Saha

Dr. S.C. Patil

Ms. Sujata Alegavi

Ms. Rutvi Thakar

Jagdu Singh Charitable Trust's (Regd.)

THAKUR COLLEGE OF ENGINEERING & TECHNOLOGY

Autonomous College Affiliated to University of Mumbai

Approved by All India Council for Technical Education(AICTE) and Government of Maharashtra

A - Block, Thakur Educational Campus, Shyamnarayan Thakur Marg,
Thakur Village, Kandivali (East), Mumbai - 400 101

Tel.: 022-6730 8000 / 8106 / 8107 Telefax: 022-2846 1890 • Email: tcet@thakureducation.org

• Website: www.tcetmumbai.in www.thakureducation.org

"International Conference on Trends in Electronics & Communication"
(IC-TELCON 2021)

Chief Patron

Mr. V. K. Singh, Chairman, TEG

Patron

Mr. Jitendra R. Singh, Trustee, TEG

Mr. Karan V. Singh, CEO, TCET, TIMSR, TIMSCDR

Program Chair

Dr. B. K. Mishra, Principal, TCET

Technical Chair

Dr. Lochan Jolly, Dean - SSW, Professor, E&TC Dept. (IC TELCON 2021)

Core Committee

Dr. Payel Saha, Professor and HOD, E&TC Dept, Convener (IC TELCON 2021)

Dr. S.C. Patil, Associate Professor and HOD, ELEX Dept., Jt. Convenor (IC TELCON 2021)

Mr. Sanjeev Ghosh, Associate Professor and Deputy HOD, E&TC Dept. Co-Convenor (IC TELCON 2021)

Mr. Hemant Kasturiwale, Associate Professor and Deputy HOD, ELEX Dept., Co-Convener (IC TELCON 2021)

Ms. Rutvi Thakar, Assistant Professor, E&TC Dept. Conference Coordinator (IC TELCON 2021)

Ms. Sujata Alegavi, Assistant Professor, ELEX Dept. Conference Co-Coordinator (IC TELCON 2021)

Treasurer

Ms. Archana Deshpande, Assistant Professor, E&TC Dept.

Publication Committee

Ms. Rashmita Kumari Mohapatra, Assistant Professor, E&TC Dept.

Ms. Sonali Singh, Assistant Professor, E&TC Dept.

Mr. Nikhil Tiwari, Assistant Professor, E&TC Dept.

Mr. Niket Amoda, Assistant Professor, E&TC Dept.

Ms. Jalpa Pandya, Assistant Professor, ELEX Dept.

Mr. Sumit Kumar, Assistant Professor, ELEX Dept.

Mr. Chandresh Yadav, E&TC Dept.

Mr. Dinesh Kanswal, E&TC Dept.

Ms. Asmita Parab, E&TC Dept.

Ms. Kinjal Joshi, E&TC Dept.

Ms. Sulbha Kashid ELEX Dept.

Technical Review Committee

Dr. A. P. Jayaraman, Rtd. Senior Nuclear Scientist, Former Head of (BARC), Mumbai India

Dr. Madhukar Pitake, Rtd. Professor, Tata Institute of Fundamental Research, Mumbai, India

Dr. Rita Pujari, Associate Director, NASA NV Space Grant/Co-Chair

Mr. Tarry Singh, CEO and Founder, deepkapha.ai, Netherlands.

Dr. S.G. Bhirud, Professor VJTI, Mumbai

Dr. U. S. Sutar, Principal, Jaywant College of Engg. & Management, Sangli, India

Dr. Kishor Kinage, Professor, PCCOE, Pune, India

CONTENT

Preface

Thakur College of Engineering and Technology (TCET) with great pleasure invites you to IC-TELCON 2021 organized by Electronics (ELEX) and Electronics & Telecommunication Engineering (E&TC) Department. International Conference on Trends in Electronics & Communication (IC-TELCON) aims to bring together researchers, engineers and students to exchange and share their experiences, new ideas and research results about all aspects in the fields of Electronics Engineering and Communication. IC-TELCON 2021 provides a platform to researchers from both academia as well as industry to meet and share cutting-edge development in the field and it aims to provide an opportune forum and vibrant platform for researchers.

This year, IC-TELCON 2021 is planned on 26th and 27th February 2021. IC-TELCON 2021 solicits research papers describing significant and innovative research contributions in the field of Signal Processing and Applications, Communication Engineering, Automation, Robotics & Control, Internet of Things & Embedded systems.

Electronics and Electronics & Telecommunication Engineering are two of the major disciplines of engineering which can be considered as backbone of progress and technology. The aim of IC-TELCON 2021 is to encourage Academic Teachers, Scientists, Students, Research Scholars and Industry professionals to innovate and invent new technology by incorporating their new ideas. IC-TELCON 2021 is a platform for discussions, deliberations and exchange of knowledge, to create new products and innovations in technology for the coming era. This year we have received 158 papers from all over the world. IC-TELCON 2021 has been able to associate with ICTACT Journal on Communication Technology (IJCT) (UGC Care) and APPLE Academic Press. We have got affiliations with Scopus indexed journals and Scientific Research journals like International Journal of Electronics, Communications, and Measurement Engineering (IJECME).

The organization of IC-TELCON 2021 is very much a team effort of TCET. I would like to take this opportunity to thank all the members of the conference committee, who have carried out a huge and complicated task to make such a grand event possible. I also wish to thank the Management of Thakur Education Group for providing us the world class infrastructure and unstinted support in all our endeavours to make this kind of event see the light of day.

Dr. Payel Saha
Convenor IC-TELCON 2021

Dr. S. C. Patil
Joint Convenor IC-TELCON 2021

Copy Right

Thakur College of Engineering & Technology, Mumbai, India

Copyright©2021 by the International TCET. Permission to make digital or hard copies of portions of this work for personal or classroom use is granted without fee provided thatthe copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page, Copyrights for components of this work owned by others than above mentioned bodies must be honored, Abstracting with credit is permitted. To copy otherwise, to republish, to post on servers or to redistribute to lists, requires prior specific permission and or a fee. Request permission to republish from: Publications Dept. TCET. For other copying of articles that carry a code at the bottom of the first or last page, copying is permitted provided that the per-copy fee indicated in the code is paid through the Copyright Clearance Center.

Notice to Past Authors of Multicon-W Published Articles

TCET intends to create a complete electronic archive of all articles and or other material previously published by TCET, if you have written a work that was previously published by TCET in any journal or conference proceedings prior to 2015, and you do NOT want this work to appear in the TCET digital Library, please inform multiconw@thakureducation.org, stating the Title of the work, the author(S), and where and when published.

ISBN Numbers

ISBN: 978-1-7369640-4-0

Printed in India

Thakur College of Engineering & Technology, Mumbai India

ICTELCON 2021		
Track: Communication Engineering		
1	Staff Availability System Using RFID	1
	Syed Mohammad Faraz, Sameer Yadav, Vishal Singh, Rutvi Thakar	
2	GSM and GPS based Automatic Vehicle Accident Detection and Alerting System	5
	Aakash Mohikar, Ajaykumar Maurya, Harsh Patel, Sanjeev Ghosh	
3	RFID and GSM Based Attendance Monitoring System	11
	Yash Pandey, Aayush Gupta, Rishabh Kakani	
4	Indoor Navigation System for Smartphone using Wireless Hotspot	15
	Adarsh Singh, Aman Sahu, Vaibhav Yadav, Vinitkumar Dongre	
5	A Three Port Microstrip-Fed Antenna for UWB-MIMO Diversity Applications	19
	Raj Kumar, Pramod Dhande	
6	Wireless Power Transmission via Solar	25
	Riddhi Vora, Sathvik Shetty, Chirantan Sinha, Mrs. Kalawati Patil	
7	A Four Port UWB Antenna for Diversity Applications	31
	Raj Kumar, Pramod Dhande	
8	Milk Adulteration Test using Microstrip Patch Antenna	37
	Vishal Kushwaha, Suraj Jha, Vikas Kumawat, Megha Gupta	
9	2x2 Array of Monopole Antenna for Gain Enhancement	41
	Kartik Maurya, Gaurav Jain, Prem Pal, Shailendra Shashtri	
10	A Review on Size Reduction Techniques and Challenge in Nonuniform Loop Antenna	45
	Siddhant Jaiswal, Akash Pathak, Manan Rathod, Shailendra P. Shastri	
11	Array of Non-Uniform Loop Antenna	49
	Anjali Gupta, Harshada Hariyan, Shubham Yadav, S. P. Shastri	
12	Low Power Multimedia Processing in WSN	53
	SnehalRaj.S.Verma, Dakshata.R.Rabbi, Sukanya.R.Konar	
13	Design and Development of Underwater Communication System using IR	57
	Rohit Singh, Saumya Jaiswal, Nikhil Kesarwani	
14	LIDAR Based Self-Driving Car with Solar Charging Capability	61
	Anish Rao Somawar, Armaan Chaudhary, Shadan Khan	
15	Indoor Tracking Using Beacon	65
	Girik Tripathi, Raunak singh Matharu, Rachit Shah	
16	Bank Locker Intrusion Detection and Alert System	67
	Anupama Hasurkar, Abhishek Dubey, Ankita Saha	
17	Performance Analysis of MRC and ZF Receivers in Massive MIMO Systems	71
	Santoshkumar Sabat	
18	Feed Location and Impedance Matching in MSA	75
	Saher Ansari	
19	Stub Loaded Circular Polarized Array Antenna for RFID Application	77
	Shastri Shailendra Pratap, Vinitkumar Dongre, Archana Deshpande, Nikhil Tiwari	

Track: Embedded Systems and Internet of Things		
20	Brain Structure Analysis Based On Naïve Bayes and Random Forest Approach	81
	T. R. Ganesh Babu, U. Saravanakumar, J. Rangarajan, R.Praveena, V.Tharani, S. Vaishnavi	
21	Pothole Reporting System for Safe Roads	85
	Kedar Sawant, Shrikant Shelar, Devashish Palyal, Dr. Payel Saha	
22	Canteen Automation System Using IOT	89
	Shivani Shenoy, Himanshu Upadhyay, Pranav Akoliya, Dr. Payel Saha	
23	Timing Based Medicine Dispenser using Embedded System	93
	Neha Ghosh, Garima Jangra, Pooja Meena	
24	Intelligent Spectacles for Accident Prevention	97
	Shrikant Sonekar, Abhishek Barve, Gaurav Habad, Gaurav Kshirsagar, Harshal Bhoyar, Kruti Sontakke	
25	Voice of the Speechless using Raspberry Pi	101
	Ujala Pandey, Deeksha P. Sharma, Shivam Singh	
26	Towards A Healthier Future Using Smart Oven App	105
	Anjali Jha, Sachin Mishra, Vijayshankar Mishra	
27	Smart Gas Sensor for LPG Leakage Detection	111
	Suraj Pal, Sagar Patel, Neel Shah	
28	Smart Mirror: Time Saving Assistance	115
	Gayatri kalyankar, Muskan Khandelia, Satyaprakash Mishra, Deepak S Shete	
29	Solar Powered Automated Irrigation System Using IOT	119
	Shruti Patel, Vishal Pandey, Anvita Birje	
30	IOT Based Coal Mine Safety System using MQTT	123
	Anand Bhagat, Shumaq Latif, Sahil Kesarkar	
31	Women's Safety Gadget using IoT	129
	Kajal Sharma, Neha Samudra, Aditi Vichare	
32	Design of Smart Helmet for Visually Impaired	133
	Sahil Bhagat, Sourav Nayak, Abhishekraj Prasad	
33	Design of Water Quality Monitoring system of Fish Farm and Analyzing Data of system	137
	Rushikesh Khochare, Prabhunath Yadav, Ramashish Sahani	
34	Development of UV Sterilization System	141
	Soham Mahajan, Nidhi Rajpurohit, Akhila Shetty	
35	IoT based real-time School Information and Security System with Live tracking	145
	Aishwary Chauhan, Shubham Choudhary, Aniruddha Gharat, Rashmita Kumari Mohapatra	
36	People Detection and Tracking using Improved Temporal Frame Differencing and CSRT Tracking	151
	Dr.K.Ramar, M.Gomathy Nayagam, M. Buvaneswari	
37	An Intelligent System for Monitoring Gases and Smoke Concentration Using Zigbee Technology	155
	Shrey Jain, Axit Mehta, Niraj Mishra, Rashmita Kumari Mohapatra	
38	Smart Indoor Air Quality Monitoring	159
	Vivek Singh, Sparsh Raikar, Sagar Pandey, Dr. Sangeeta Mishra	

39	A Comparative Study of Electric Vehicle Charger And Battery Management System: A Review	163
	Siddhesh Adavade, Nikhil Shirsath, Nikhil Abraham, Rohit Shirudkar, Abhishek Jamnare	
40	Solar Water Heating System	169
	Swapnil Yadav, Subodh Yadav, Sejal Yadav, Ankita Kumari Yadav, Aniket Yadav, Aditya Yadav, Megha Gupta	
41	IoT based Monitoring system for Efficient Irrigation using a Markov Decision Process	175
	Ashutosh Patel, Vinay Singh Rawat, Deeksha Shriyan, Mr. Nikhil Tiwari	
42	Development of RESPO-Portable Testing Kit for Respiratory Diseases	179
	Ankit Singh, Swapnil Thorave, Sushant Tiwari	
43	Autonomous Water Surface Garbage Collector	183
	Ritik Chaurasiya, Mukesh Choudhary, Aditya More	
44	Alarm System for Underground Optic Fibre Cable	187
	Harsh Yadav, Ankush Yadav, Antim Yadav	
45	Iot Based Biometric Implementation on Raspberry Pi	191
	Yashvardhan Dwivedi, Vinay Chaurasiya, Indroneel Das, Vikas Gupta	
46	Implementation of Navigation System using NavIC	193
	Abhishek Singh, Ishaan Anand Shinde, Om Pancholi	
47	Design and Implementation of Industrial Surveillance System for Oil and Gas Industry of Textile Industry	197
	VikasKeshari, AmitaGautam, Sujit Pandey	
48	Use of Solar Dryers in Agricultural Products	201
	Pratik Jain, Raj Burde, Satyam Sharma, Aniket Yadav, Akshat Doshi, Dhruv Shelke, Deepak Borana	
49	Development of Textile Industry using IoT for Temperature, Humidity and Cotton Dust Control	209
	Vishal Chaurasia, Vijay Iyer, YashKarekar	
50	Android Phone Operated Home Appliances Using Bluetooth Technology	213
	Vivek Goswami, Agrima Gupta, Dhruvik Dankhara, Sukruti Kaulgud	
51	IOT Based Temperature and Humidity Monitoring System Using Arduino	217
	Karan Salunkhe, Akhilesh Shelke, Mayank Sharma	
52	Blood Oxygen and Heart Beat Monitor	221
	Paridhi Sureka, Sonal Rao, Srishti Pandey, Sonia Behra	
53	Artificial Clinician Using IoT For Health Monitoring System	223
	Niwash Yadav, Sachin Yadav, Ujjval Maurya, Mrs. Kalawati Patil	
54	Wireless Mobile Battery Charger Circuits	229
	Vinanti Rao	
55	Automated Health Care System for Pregnant Woman through Primary Health Centre using IoT and Machine Learning Techniques	233
	J.Preetha, V.Karuppuchamy, R.Kavishree, M.Ramya, K.Vijay, N.Subashini	
56	Vehicle Security Using NFC Ring	239
	Anurag Singh, Jatin Tak, Atul Yadav	
57	RFID Tag Based Bus Tracking System	243

	Satyam .S. Singh, Rana Shivamev Singh, Jaikumar Yadav, Mrs. Archana Deshpande	
58	Smart Vehicle Accident Detection System Using IOT	247
	Ms. Richa Mamtora, Mr. Shubham Kanaujia, Mr. Shubham Maurya	
59	Driverless Metro Train	251
	Kalpit Joshi, Harshad Kolhe, Neha Mishra, Payel Saha	
60	Automatic Crack or Fault detection on Railway tracks using PLC	255
	Swapnil Bhagat, Shivam Mishra, Riya Singh	
Track: Automation, Robotics and Control		
61	Animal Adoption Website Design	259
	Tanishka Khatik, Sweni Doshi, Shlok Bhagat	
62	Kitchen Waste Management Website	263
	Rishab Pandey, Akshat Rathod, Swapnil Yadav	
63	Online Bookstore for Used Book	267
	Rahul Singh, Shivam Singh, Shravan Singh, Purnima Chandrasekar	
64	Hangman Project	271
	Aayush Gupta, Rishabh Kakani, Yash Pandey	
65	Weather Monitoring Website (WeMo)	273
	Anuj Maheshwari, Shara Yasmin Ahmed, Shruti Chaube, Dr. Payel Saha	
66	Design and Develop A Database on Household Appliances and Suggest Methods to Recycle Them	277
	Ishan Gosain , Yash Dubey, Kamlesh Jadhav, Purnima Chandrasekar	
67	Design and Development of Website on Tourism	281
	Subodh Yadav, Sumiran Singh, Shlok Sharma, Deepak S. Shete	
68	Abhigyata - Lets Change the Way We Perceive Mental Health	285
	Vedant Panchal, Ananya Srivastava, Aniket Yadav	
69	A Convertible Smart Wheelchair for Disabled Persons	289
	Mrs. Poorva Waingankar, Dishant Doshi, Kshithij Shetty, Jay Mehta	
70	Career Guidance Website for Undergraduate Students	293
	Rishav Biswas, Yash Amin, Advait Chirmule	
71	Voice Control Based Multipurpose Product Sorting System	297
	Kaustubh Rajan, Aakash Mishra, Prashant Jha	
72	Coin Sorter Using Arduino	303
	Aneesh Patne, Gauravkumar Singh, Jashbeersingh Rana	
73	Website for Infographics of New Education System	307
	Shweta Chavan, Roshini Kini	
74	Implementation of Departmental Time Table Generator	311
	Shouvik Roychowdhury, Mrs. Archana Desphande	
75	Streamlining The Hospital Management Sytem For Current and Future Pandemics	315
	Shefali Jadhav, Gagan Jain, Ananya Koppar, Niket Amoda	
76	Engineering Government Jobs	319
	Shreya Mishra, Kunal Miskin, Vikas Mishra	
77	Ayurveda For You and Me	325
	Sheetal Suresh Chaudhary, Shravani Deshmukh, Neha Gupta	
78	Autonomous Drone for Social Distancing Surveillance	329

	Sujay Kadam, Geeta Seshapalli, Abhilash Nayak, Bushra A. Shaikh	
79	E-Commerce Website for Visually Impaired	335
	Adhik Pandey, Pratiksha Shrivastava, Dharana Singh, Archana Deshpande	
80	Design a Website of Educators for Needy People and Suggest Application Area	339
	Meghana Anthikad, Sakshi Chavan, Harneet Kaur Dehiya, Rashmita Kumari Mohapatra	
81	Automated System for Transportation	345
	Omkar Nandan Choudhary, Lovlesh Dagar, Vinay Manala, Sunil Khatri	
82	Development of Food and Medicine Serving Model Using Obstacle Mapping	349
	Shruti Shukla, Sriya Vaishnav, Rishabh Sajwan	
83	Smart Attendance System	353
	Aditya Sumant Mishra, Shivam Ajay Pandey, Arun Kumar Singh	
84	Automated Ration Distribution System	355
	Ashish Paul, ShubhamKarangutkar, Swastik Banerjee	
85	Subject-wise Learning Management System	361
	Adnan Abidi, Irfan Khan, Dr. Payel Saha	
86	Design and Development of Website on Major Psychological Issues and Symptoms	365
	Tanisha Singh, Ria Sinha, Sejal Yadav	
87	Laser Based Vibration Sensor Through Mobile	369
	Shalini .J. Yadav, Rajan Yadav, Prathmesh Yadav	
88	E-Books for Engineering Undergraduates	371
	Shubham Bhatt, Aashvi Jain, Priyanshu Jain	
89	Guidelines for E-Waste Management	375
	Gupta Shivam Mataprasad, Kulampurath Sharath Anand, Bhunia Mausam	
90	Environmental Awareness (Forest Conservation)	379
	Anuj Vishwakarma, Yash Rai, Vaibhav Upadhyay	
91	Hospital Management System	381
	Sarvesh rane, Abhishek Sakpal, Meet shah	
92	Design and Develop A Database for Comparison of Various Automobiles	385
	Atul Kumar Tiwari, Jatin Tak, Gaurav Yadav	
93	Design of Media Player	389
	Mohit Jain, Harshit Srivastav, Sonu Gupta	
94	Traffic Management System for Emergency Vehicles	391
	Prathu D. Garg	
95	Aerial Surveillance Drone	397
	Pratik Bhuwania, Mohit Butola, Vatsal Doshi, Niket Amoda	
96	Health Management and Diseases Control	401
	Vishal Jana, Om Prakash Jangid, Aakash Jha	
97	Web Development on Reuse of Electrical Equipment	405
	Ritvik Moorthy, Nivesh Pawar, Manas Patil	
98	Electronic Waste Management	407
	Dhruv Pandey, Anuj Pandey	

99	Development of Unit Converting Website Using CSS, HTML and JavaScript	409
	Balkrishna Giri, Ravikant Dangi, Pavan Gupta	
100	An Online Student Grievance Support System	413
	Harsh Modi, Pragnesh Poojary, Kalp Shah	
101	Design And Development of Website on Different Ailments and Its Home Remedies	417
	Ashish Pandey, Ami Patel, Jaaee Rahate	
Track: Signal Processing & Applications		
102	Malady Detection on Plant Leaves Using Unsupervised Learning Algorithm	421
	Pushya Chaparala, Siva Shankar Rao	
103	COVID-19 Spread Analysis	425
	Atif Khan, Sanjana Mishra, Mansi Mistry, Dr. Payel Saha	
104	Measuring Calories and Nutrition from Food Images	429
	Atul Kumar Tiwari, Punit Savlesha, Yash Shetiya	
105	Brain Tumor Detection Using Image Segmentation	435
	Amogh Johari, Nikhil Pandey, Rahul Pandey	
106	Covid-19 Hospital Data Management	439
	Avyay Rao, Aman Rawat, Shantanu Varshney, Deepak S. Shete	
107	Live Attendance System using Image Processing	443
	Pragun Tiwari, Gaurav Yadav, Jaihind Yadav, Deepak S. Shete	
108	GUI Based Handwritten Digit Recognition using CNN	447
	Mr. Durgesh R. Pandey, Mr. Abhishek M. Tiwari, Mr.Ashwani V. Gupta, Mrs. Purnima chandrasekar	
109	Low Cost Heart Beat Measurement System and Oximeter	451
	Kirti Moily, Nivedita Mishra, Vedhashree Naik	
110	Optical Steganography for Security Enhancement	455
	Aniket Narpatraj Bafna, Mahek Modi, Shrushti Sabhapati, Ms. Sonia Behra	
111	Prediction of Graduate Admissions Using Regression Models	459
	Naman Joshi, Rohit Gupta, Vivek Gupta, Purnima Chandrasekar	
112	Implementation of Network Based Intrusion Detection System using Machine Learning	465
	Sanjana Singh, Rahul Varma, Prathamesh Tendulkar, Mr. Deepak S. Shete	
113	Automatic Toll Collection System using Image Processing	469
	Abhishek Sukla, Riya Singh, Pooja Yadav	
114	Loan Approval System using Big Data and Machine Learning	471
	Ankit Dubey, Ashutosh Dubey, Ravi Mishra	
115	Visioning of Deep Learning in Future	473
	Maryam Rasoolzadeh	
116	Smart Glasses for Displaying Multimeter Readings	479
	Chiranjeet Chaudhary, Yash Chaughule, Sushant Tiwari	
117	Designing Flood Prediction System Based on Weather Parameters using ML Model	483
	Shraddha Gupta, Nairuti Mehta, Akshata Parulekar	
118	Fingerprint Enhancement and Feature Extraction	487
	Sonal Singh, Yogita Prajapati, Mansi Singh, Dr. Sangeeta Mishra	

119	Automated Minnesota Dexterity Test for Physiotherapeutic Applications	493
	Harsh Kudtarkar, Anushka Bane, Madhul Chand, Dr. Sangeeta Mishra	
120	Assistive Technology for Deaf and Dumb	497
	Ms. Sushma Mishra	
121	Breast Cancer Detection Using Genomic Data	501
	Mohit Yadav, Rohit Singh, Hanish Sharma	
122	Analysis of Emotional Health using ECG Data Acquisition System	505
	Anshif Thajudeen, Prakash Goud, Akanksha Gupta, Dr. Lochan Jolly	
123	An Enhanced System for Restoration and Value Maximization of Images using Prior and Generative AI-Based Models	509
	Disha Revandkar, Shivani Srivastava, Aanwi Tarihalkar, Niket Amoda	
124	Online Handwritten Signature Verification using SVM	515
	Romir Dey, Dhrumin Shah, Manoj Chavan	
125	Adaptive Blending Control Design Based on Soft O2 Sensor Measurement	521
	Sheng Zeng, Abhijit Barman	
126	Phishing Website Detection Using Machine Learning based on URL Features	525
	Gaurang Pandit, Dr. Lochan Jolly	
127	Design and Implementation of False Currency Detection using UV Detection and Image Processing	531
	Yash Majalkar, Abhishek Mishra, Aditi Verma	
128	Online Handwritten Signature Verification using Multilayer Perceptron Neural Networks	535
	Vidhi kokanee, Hiral Pal, Lokesh Dugar, Manoj Chavan	
129	Design and Development of Intelligent Traffic Lights Control	539
	Mrs. Poorva Waingankar, Anjali Singh, Hrishu Singh, Ajay Yadav	
130	Automation in Attendance System Using Facial Recogintion	543
	Anuj dubey, Shivam Dubey	
131	Driver Drowsiness Detection Using Face Recognition	549
	Sourav Dambal, Priti Ghosh, Maithilee Malewar, Megha Gupta	
132	Automatic Number Plate Recognition System	555
	Khushi Shetty, Vaishnavi Shetty, Shikha Singh	
133	Product Price Prediction using Machine Learning with Image Processing	561
	Aamir Kazi, Pearl Kothari, Niyati Morkhiya	
134	Melanoma Cancer Detection using Deep Learning	567
	Mukul Gupta, Hardika Jain, Adwait Raut	
135	Better Public Spaces for All	571
	Vaibhav Kapse, Yaseen Khan, Sahil Kakanj	
136	Waste Segregation Using Image Processing	575
	Bhavik Bhatt, Aditya Wadikar, Yash Yadav	
137	Sign Language Recognition System	579
	Jagdish Lohar, Rohit Pal, Vimlesh Pathak	
138	Comparison of Logistic Regression and Decision Tree method for Credit Card Fraud Detection	583

	Tulika Kumar, Anusha Lathi, Yukti Mathur, Prateeksha Shanoj	
139	Assessment of Water Quality Index Using Fuzzy Logic	587
	Dr.Sangeeta Mishra, Nandita Mishra, Shashwat Shukla	
140	Human Emotional Recognition Using Temporal Features by Multiclass support vector machine classifier	593
	T. R. Ganesh Babu, U. Saravanakumar, B.Gopi, S. Selvarasu, M.Mohanavarthini, R.Monisha	
141	Brain Structure Analysis Based on Naïve Bayes and Random Forest Approach	597
	T. R. Ganesh Babu, U. Saravanakumar, J. Rangarajan, R. Praveena, V. Tharani, S. Vaishnavi	
142	Analysis of Satellite Images for Detection of Depletion of Water Resources	601
	Akshata Ramane, Niketan Rai, Priyanka Mishra	
ICPAGE 2020		
143	Traffic Management System for Emergency Vehicles	605
	Prathu D. Garg	
144	Green Campus using IoT	611
	Yashi Rajesh Chaturvedi, Amal Premdayal Mehta, Bhavesh Pratap Purohit, Ms. Sukruti Kaulgud	
145	OPFET under Solar (AM0) Illumination	615
	Jaya V. Gaitonde, R. B. Lohani	
146	An Analytical Analysis of High - κ Oxides in Nano-Scale CNFET Photodetector	619
	Kalawati Patil, Lochan J. Jolly, B. K. Mishra	
147	Enhancement of Power Conversion Efficiency with Optimization of Device Dimensions and Doping	627
	Sukruti Kaulgud, B. K. Mishra	
148	Dual-Axis Solar Tracker	635
	Ritik Mukesh Bhandari, Sagar Prakash Jaiswal, Om Vimlesh Lal, Ms Sukruti Kaulgud	
149	CMOS Image Sensors: Ideal for Digital Cameras	639
	Ms. Sonia Behra, Dr. Payel Saha, Ms. Anvita birje	
150	Nanotechnology Application in Agriculture	645
	Ms. Anvita Birje, Ms. Sonia Behra, Ms. Megha Gupta	
151	IoT Based Hospital Inventory Management System	649
	Anjali Nilendu Jha, Mrs. Payel Saha	
152	Wireless Power Transmission via Solar	653
	Riddhi Vora, Sathvik Shetty, Chirantan Sinha	
153	Phishing Website Detection Using Machine Learning	659
	Gaurang Pandit, Lochan J. Jolly	
IOT SIAC 2020		
154	IoT Based Smart Home Automation System Using ARM7 LPC2148 & GSM/GPRS	665
	Priya Khillare, Dr. L. K. Ragha	
155	A Contactless Passport Verification System at Airports Using RFID Technology	669
	Vinit P. Kharkar, Ajay P. Thakare	

156	Home Automation Using IoT	673
	Santosh Saw, Chhayank Singh , Sachin Tiwari, Adarsh Sharma, Vishal Thakur, Vivek Tiwari	
157	IoT Enabled Smart Container	679
	Aman Khan Pathan,Lovlesh Dagar, Shivang Bhargava, Vinay Chaurasiya, Sunil Khatri	
158	IoT based Weather Monitoring System	685
	Shreya Mishra, Chinmay Deepak Ghodke, Sushma Rathod, Palak Dhanpatraj Lunawat, Aditya Chatterjee, Sukruti Kaulgud	
159	Implementation of Air Monitoring System and Detection and Purification of particles present in Air using IOT	689
	Shubham Malji, Shloka Rao, Vasu Jivani	
160	Implementation of Smart Storage System	695
	Ruchi Bhogate, Atharv Deshmukh, Shivani Joshi	
161	Holographic AR Simulation for Healthcare System	699
	Pratik Malviya, Ashish Yadav, Bhavin Patel, Rohan Sonar, Hemant Kasturiwale	

Staff Availability System Using RFID

Syed Mohammad Faraz
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharashta, India
sfaraz6027@gmail.com

Sameer Yadav
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharashta, India
yadavsameer074@gmail.com

Vishal Singh
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharashta, India
vishalthakur999544@gmail.com

Rutvi Thakar
Assistant Professor
Thakur College of Engineering and Technology
Mumbai, Maharashta, India
rutvi.panchal@thakureducation.org

***Abstract* — This paper presents a design and implementation of a system which shows the availability of staff member within the office space or staffroom to visitor waiting outside the staffroom and will maintain the work environment of staffroom. The proposed work comprises of two most popular trend in technology research; Arduino - UNO and RFID.**

Keywords - work environment, Arduino-UNO, RFID reader EM-18, Staff availability.

I. INTRODUCTION

The main aim of this project is to construct a staff room management system with minimizing the limitations of existing method and also enhancing the privacy level of the staff members which hindered in previous existing systems. The staffroom management system will provide an interface and means through which visitor can get know about the staff members present in staffroom. So basically, this project focuses on the availability of the staff members within their allocated office space. In the survey conducted, few papers on design and implementation of an automatic staff availability tracking system have been studied thoroughly and analyzed to understand the various technologies used for web applications such as html, java, php [1]. After studying the IEEE papers and other technical paper we got an idea about the use of RFID and its implementation and using it in a way which doesn't hinder privacy of the staff members [2]. Apart from research papers other sources from internet were used to understand the previous developments in the field of staff availability-based. Using this information to design a system that can provide with different functionalities. The staffroom management system focuses on maintaining the work environment of the staffroom. Maintaining the work environment of the staffroom is very important as many important works is carried out by the staff members and also to provide visitor with details of the staff member so that student time can be saved. Using RFID tags to detect the presence of staff members in staffroom, provide information to visitor about presence using LCD touchscreen, and interactive user interface for visitor [2]. This system is not only helpful but worthy to implemented. The staffroom management system can used in schools, colleges and in universities. This system can be installed outside the staffroom so, the visitors can get information about staff members present in the staffroom and to maintain work environment of staffroom.

The system is aimed at reducing the amount of time that students, visitors and faculty members spend looking for specific employees without being hindered by the ethical issues surrounding RFID based staff tracking. It focuses on the availability of the staff members within their allocated office space [1].
This work introduces a new method of monitoring student attendance using Radio Frequency Identification (RFID) based on the Internet of Thing (IoT). This proposed project gives idea about interfacing of RFID and IoT in our case we are going to interface RFID reader EM-18 using Arduino- UNO [2].

•The staffroom working environment won't be disturbed
by continuous arrivals of visitors/students.
•Students/visitors can easily get the details of the concerned staff members available in staffroom, thus saving their time. There are many systems available for tracking staff members.
•A good percentage of them involve personal wearing RFID tags that are scanned when move from one building to another building. This has brought about ethical issues regarding privacy of staff members as they were tracked continuously, so this issue is also solved [1].

Maintaining work environment of staff room is very important as teachers and other staff members have many other responsibilities apart from teaching such as maintaining students record for particular semester, preparing marksheets and many other important works. And getting disturbed frequently may lead to some serious mistake for example if marks of student is wrongly got entered due to frequent disturbance caused due visitors. So, to overcome this problem we have proposed a Staffroom Management System which will help in maintaining staffroom work environment by providing list of staff member who are available inside the staff room outside the staffroom itself and even staff members will be informed about the visitors or students.

II. FEASIABLITY STUDY

After thorough of various research papers and reports on different system based on Raspberry-Pi and other component, we got clear view for our project such what language and software we have master so that we proceed with our project. Our Project would provide visitors the details of staff member available in the staffroom, so that they should not disturb the work environment of the staffroom, thereby providing details of visitor to staff member sitting inside the staffroom. Market potential of this system is very high. In India, there are 789 universities, 37,204 colleges and 11,443 stand-alone institutions. If this system is integrated in universities and colleges, market is huge. Hurdles: In college staffroom managing the large crowd of visitors is a problem. Because normally in college's break is of 30 to 40 minutes and at that time majority of people gather around the staffroom to solve the doubts and queries due to low speed of system it can cater one student at time. Due to which very less queries will be solved. So, use of IoT and web technologies speed of the system can be improved. Man, hours required will be about 300 hours for development of project, testing, analysis, user manual, report. If product is developed with full integration on a single PCB, with all sensors and modules as an integral part of system, cost can be reduced. Procurement of material in mass scale will also reduce overall cost. Product selling price will be based on market conditions and availability of other products in this field at the time we introduce it in market. Other things to consider are the geographic influence on the market, demographics, analyzing competitors and more.

III. PROPOSED SOLUTION

We are going to make use of Arduino-UNO and RFID for hardware implementation of Staffroom Management System. Our proposed system is demonstrated with help of diagram shown in fig. 1

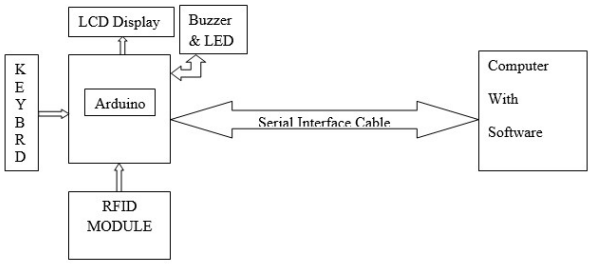


Fig. 1. Basic diagram of Staff room management system

Software on Computer will contain details of staff present in Staffroom. Software will also contain form for student to fill his details for meeting staff in staffroom. Student will put his details in software viz, his name, branch and to whom he wants to meet. This information will be transferred through serial cable to Arduino based system.

Arduino based system will contain a RFID module. A Staff who enters or exits the Staffroom has to show his ID Card at the RFID module. If card is valid, He / She is allowed to enter. Otherwise, there would be alarm on Buzzer and LED will Blink. Staff members present in staffroom will be detected using RFID and Arduino.

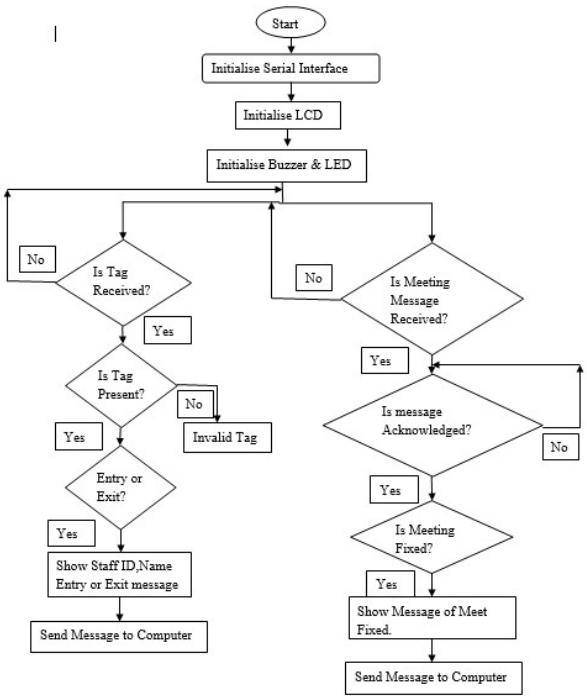


Fig. 2. Arduino system flowchart

A. Hardware implementation:

a) Arduino – UNO:

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits.

b) RFID Reader EM-18 and Tag:

EM-18 is used like any other sensor module. First, we choose the mode of communication between MODULE and CONTROLLER. Next, we will program the controller to receive data from module to display. Next power the system. When a tag is brought near the MODULE it reads the ID and sends the information to controller. The controller receives the information and performs action programmed by us.

c) LCD 16x2:

Alphanumeric LCD display module, meaning can display alphabets and numbers. Consists of two rows and each row can print 16 characters. Each character is built by a 5×8- pixel box. The 16x2 LCD is interfaced with Arduino to display different messages at teacher's side.

A Liquid crystal display is a form of visual display used in electronic devices, in which a layer of a liquid crystal is pack in between two transparent electrodes. We are

using basic-generic 16x2 liquid crystal display (i2c bus module version) with an Arduino.
Each I2C bus consists of two signals: SCL and SDA. SCL is the clock signal, whereas SDA is the data signal. The current bus master generates clock signal; some slave devices require more time to prepare data before the master attempts to clock it out. This is called "clock stretching" There is a inbuilt PCF8574 I2C chip that converts I2C serial data to parallel data for the LCD display in I2C module.
These modules are currently come with a default I2C address of either 0x27 or 0x3F. To find version, check the black I2C adaptor board on the underneath of the module. If there 3 sets of pads labelled A0, A1, & A2 then the default address will be 0x3F. If there are no pads the default address will be 0x27. This module has a contrast adjustment pot on the bottom of the display. This may require modifying for the screen to display text properly. It has total of 20 male pins. Out of which 16 pins are faced to rear side and 4 pins faced towards front side. The 16 pins for connect to 16x2 LCD and the 2 pins out of 4 pins are SDA and SCL. SDA is the serial data pin and SCL is the clock pin.I2C Module has POT on it. We can control the variance of the LCD display by revolving this POT. And there is a jumper fixed on the module. When we remove the jumper, the backlight of the LCD display will go OFF.

I2C CharacterLCD	Arduino
GND	GND
VCC	5V
SDA	A4
SCL	A5

Fig. 3. I2C LCD Connections

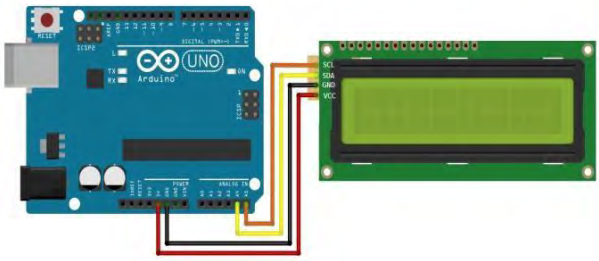


Fig. 4. Arduino-Uno and LCD 16x2 Interface.

In RFID systems, a tag is a tiny silicon chip plus an antenna. The tag can be mobile or static. It is scanned by stationary or mobile readers using radio waves. The microcontroller is an integrated circuit or a chip with a processor and other support devices like data memory, I/O ports, a serial communication interface, etc. which all integrated into one board [2]. We use RFID EM-18 reader to interface with Atmega328P [2].

Fig. 3. The Hardware Interface [2].

Figure 2 shows the hardware interface of Atmega328P Microcontroller and MFRC522 RFID Reader. Figure 3 shows the flow chart for reading the tag and sending it to the Local machine.

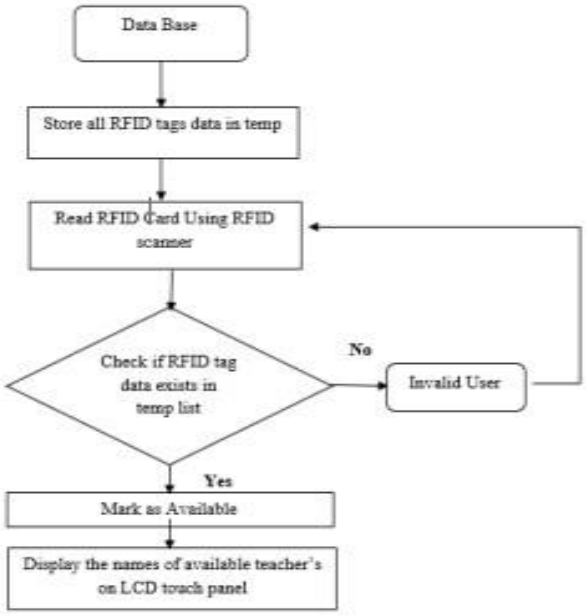


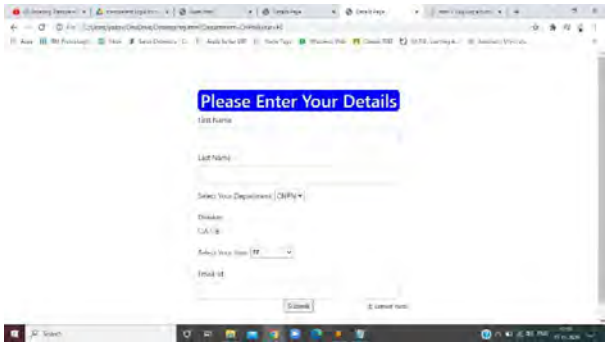
Fig. 5. Flowchart for reading RFID data.

B. Software implementation

The Login page at student side is developed using HTML and CSS. The proposed framework will include aspects of engineering from data collection and aggregation, analysis, data processing, profiling, classification, to hardware modelling, simulation, and integration [2].

IV. RESULT

The system is simple and flexible for the users because it has a simple window. Figure (below) shows the login window which will be at the student side it will be containing different sections which will be used for taking students/visitors details.



V. CONCLUSION

Our goal is to develop an easy to use, efficient and ready to deploy RFID-based staff availability system. The system provides a practical and efficient solution for maintaining work environment and providing names of faculty present within the office space to visitor thus saving the visitor's time.

The proposed staff availability system uses the concept of Arduino and RFID interfacing for showing the faculty members name on local machine present outside the staffroom. For future work, we would also like to give access to students about faculties present in staffroom on their mobile phone and also to teachers so that they can know about visitor directly on phone using IoT, so that multiple queries can be catered at one time.

REFERENCES

[1.] Kyle Stone, Jan Spies,"Design and Implementation of Automatic Staff availability Tracking System", IEEE Transactions on communication and security, pp 1-3, Dec 2015.

[2.] Soumil Nitin Shah,Abdelshakaour Abouzneid,"IoT Based Smart Attendance System (SAS) Using RFID", IEEE transactions on Applications and Technology Conference, pp. 1-6, Aug 2019.

GSM and GPS based Automatic Vehicle Accident Detection and Alerting System

Aakash Mohikar
Department of Electronics and Telecommmunication
Thakur College of Engineering and Technology Mumbai, Maharashtra, India
aakash.mohikar@gmail.com

Ajaykumar Maurya
Department of Electronics and Telecommmunication
Thakur College of Engineering and Technology Mumbai, Maharashtra, India
mauryaajaykumar99@gmail.com

Harsh Patel
Department of Electronics and Telecommmunication
Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
harrypatel270@gmail.com

Sanjeev Ghosh
Associate Professor
Thakur College of Engineering and Technology Mumbai, Maharashtra, India
sanjeev.ghosh@thakureducation.org

***Abstract*— Now a day's major part of the accident due to uneven interruption of vehicles and irregular driving by the owner. There is a lot of study about predicting detecting the vehicle accident but there is no pre intimation to the drivers about the accident. In this project, we propose to overcome the accident. Thus, we provide a solution based on accident detection using sensors this system will collect the necessary information or data from the sensor, and through a machine learning algorithm, the accident will be predicted using data sets. The essential data or values are collected using a vibration sensor are processed and when it reaches the threshold value which exceeds the predefined value a notification is passed to the user's predefine contacts, nearby police station, and hospital. Some people can be saved at that time, but because of lack of information, time, and place it may not be possible. Our project will provide an optimum solution to that drawback. According to this project when a vehicle meets with an accident an alert message will be sent to the registered contacts.**

Keywords—GSM, GPS, Accident, Detection, Alerting, Sensors, Vehicle, Emergency Services.

I. INTRODUCTION

The main aim of this project is to construct a smart vehicle system with minimizing the limitations of existing methods and also enhancing the security of vehicles and human beings and also reduces the accidental injuries. smart vehicle system will entail a speed and other parameters of vehicle sensing mechanism which automatically messages to personal contacts with the details of vehicle position when an accident occurs using the GSM/GPRS system [1].

From various research papers and reports on road accidents studied, it was clear that the major reason for road accident death was the delay in providing help to the accident victims. Our Project would inform accident victim's family members about the accident instantaneously, so that help to the injured in road accident could be delivered as soon as possible, thereby increasing the victim's survival chances. Many systems available have only alert system, we are integrating preventive methods like fire and high temperature detection which may prevent accidents [2]. Automatic accident detection focuses on increasing the safety, automatic accident detection, emergency assistance and road hazard warning dissemination [3].

The impact of rapid Incident Detection on Freeway accidents fatalities focuses on reducing the time between the occurrence of accidents and estimates the impact of freeway incident detection systems along with providing fatality reduction benefits in an economic way. Using smartphones to detect car accidents and provide situational awareness to Emergency response provides solutions to the major problems in detecting traffic accidents to avoid false positives and increases preparedness to emergency responders [4,5]. This system is not only efficient but also worthy to be implemented. The Accident Detection and Messaging System can be fitted in the vehicle (Ambulance or the Police) and they are informed about any such untoward incident at the go [6].

The system also contains fire sensor. So, in this project they have used GSM/GPRS modem to locate the exact position of the vehicle. The sensor for the accident detection is the GPS receiver. GPS receiver provides speed information in every second. The GSM/GPRS modem utilizes the GSM network to send the location of the accident. The modem can be controlled by Arduino UNO.

II. RELATED WORK

In the survey conducted, few papers on accident detection algorithms have been studied thoroughly and analyzed to understand the previous developments in the field of accident detection, the different ways in which such a system can be developed to provide different functionalities and also to design a new system which can combine the advantages of these algorithms. Market potential of this system is very high. In India, passenger vehicles purchased in 3.4 million in 2019. If this system is integrated in vehicles as a part (component), market is huge. Old vehicles can add this system to their vehicles.

Vardhani Radhakrishnan [1] the main aim of this project is to construct a smart vehicle system with minimizing

the limitations of existing methods and also enhancing the security of vehicles and human beings and also reduces the accidental injuries. Smart vehicle system will entail a speed and other parameters of vehicle sensing mechanism which automatically messages to personal contacts with the details of vehicle position when an accident occurs using the GSM/GPRS system. The system also contains fire sensor and an eye blink sensor. A fire sensor, eye blink sensor which senses various parameters of the vehicle is connected to a microcontroller which detects when the abnormal conditions occur or any accidents occur then sends text message, using GSM technology, to the driver's private contacts.

R. Kannan, R. Nammily, S. Manoj, A. Vishwa [2] Wireless Vehicular Accident Detection and Reporting System notify emergency responders immediately by utilizing in-vehicle sensors, such as accelerometers and airbag deployment monitors to detect car accidents.
Hossam M. Sherif, M.Amer Shedid, and Samah A. Senbel [3] the main objective of this paper is to create a Real Time Traffic Accident Detection System (RTTADS) using Wireless Sensor Network (WSN) and Radio-Frequency Identification (RFID) Technologies. This paper explains the hardware prototype setup for RTTADS, the algorithms used, the advantages and the limitations of the entire system. Also, the configuration of the setup and application software is elaborated. Sensors installed in a vehicle detect the accident's location, the vehicle's speed just before the accident and the number of passengers in the vehicle. The sensors then send an alert signal to a monitoring station. The monitoring station, in turn, tracks the location where the accident has occurred and directs casualty alert to the authorities concerned.

Spurti Shinde [4] proposed an Accident Detection and Alert Systems for Immediate Emergency Services which explains accidents are responsible for a large number of casualties each year. In some cases, deaths are caused due to unavailability of immediate medical aid to the victim which can be avoided with the help of an automated system that will reduce the time consumed in activities such as taking the victim to the nearest hospital, completing formalities such as filling forms and also involving police in case of major crashes. This review compared various algorithms and technologies that have been developed for detecting different types of accidents. The purpose is to analyze various algorithms studied in this survey in terms of efficiency, advantages and disadvantages and enhance the best suited algorithm for developing an efficient system that synchronizes emergency services for accident detection.

Md. Syedul Amin, Jubayer Jalil, M. B. I. Reaz [5] proposed an Accident Detection and Reporting System using GPS, GPRS and GSM Technology, where the information sent as a GPRS data and SMS will be received by a GSM/GPRS modem connected to a computer. A middleware will be written to interpret the SMS and GPRS data. An appropriate program will be written so that Google Maps can be incorporated and the accident location is automatically plotted in the map utilizing the information from the interpreted SMS/GPRS data. It will also show the previous speed of the vehicle before committing the accident. This data will help the Alert Service Center to assess the severity of the accident basing on the speed.

Bharath P, Saravanan M, Aravindhan K [6] have proposed a Smart Vehicle accident prediction using machine learning algorithm where the machine learning algorithm can be categorized into supervised, unsupervised, semi supervised and reinforcement learning. Here we use supervise machine learning algorithm for implementing vehicle accident prediction and detection system using an IoT technique the vehicle tracking system (VTS) can be built. Vehicle tracking system combines the use of automatic vehicle location of individual vehicles with software that collects these fleet data for a comprehensive picture of vehicle locations.
Accidents not only bring loss to life and property but also to our economy. Transportation has evolved greatly over time. With modern technology, the automobile industry has obtained new heights with respect to speed, security, efficiency, and comfort. But with this improvement in technology, there has also been an increase in the rate of accidents, and sometimes these accidents even lead to death. Majorly these deaths are causing due to the delay of the proper medical aid provided to the road accident victims. We've proposed to build an automatic vehicle accident detection system which will entail a speed and other parameters of vehicle sensing a mechanism which automatically messages to personal contacts with the details of vehicle position when an accident occurs using the GSM/GPRS system.

III. PROPOSED MODEL

A. Block Diagram

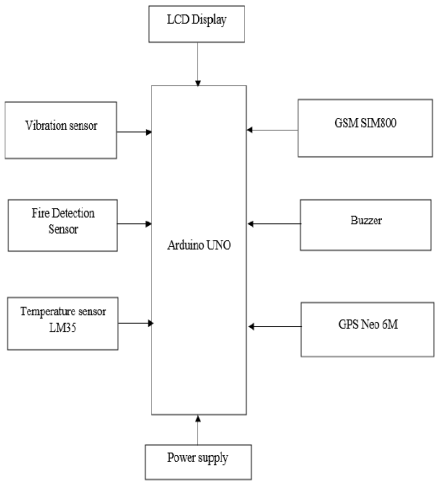


Figure 1. Block Diagram

1. Arduino UNO: The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits.

2.Impact/Vibration sensor: An impact sensor is a device which indicates whether a physical shock or impact has occurred. Shock detectors can be used on shipments of fragile valuable items to indicate whether a potentially damaging drop or impact may have occurred.

3.Fire detection Sensor: A flame detector is a sensor designed to detect and respond to the presence of a flame or fire, allowing flame detection. Responses to a detected flame depend on the installation, but can include sounding an alarm, deactivating a fuel line (such as a propane or a natural gas line), and activating a fire suppression system.

4.Temperature Sensor: The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly- proportional to the Centigrade temperature. The LM35 device is rated to operate over a −55°C to 150°C temperature range, while the LM35C device is rated for a −40°C to 110°C range (−10° with improved accuracy).

5. SIM800 GSM module: It is a complete Quad-Band GSM/GPRS module that combines GPS technology for satellite navigation. The compact design which integrated GPRS and GPS in an SMT package will significantly save both time and costs for customers to develop GPS enabled applications.

6.GPS Neo 6m: The NEO-6M GPS module is a well-performing complete GPS receiver with a built-in 25 x 25 x 4mm ceramic antenna, which provides a strong satellite search capability. With the power and signal indicators, you can monitor the status of the module. Thanks to the data backup battery, the module can save the data when the main power is shut down accidentally.

B. Flowchart

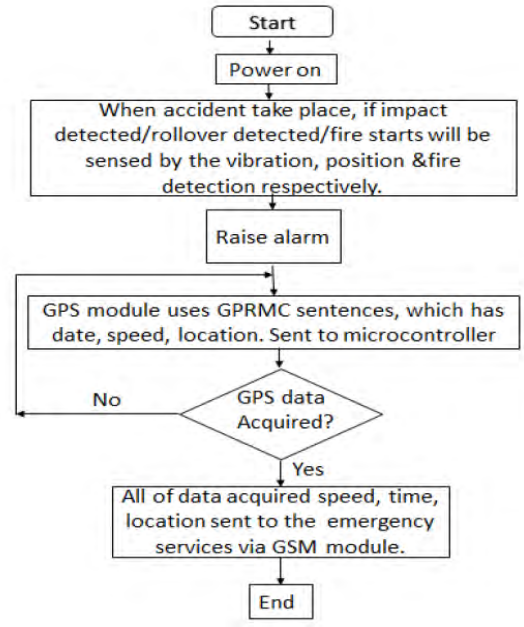


Figure 2. Flowchart of the accident detection and reporting system

Accident/fire is detected by the vibration sensor and flame sensor and alarm is raised. If temperature exceeds 50 degree Celsius, a warning signal is displayed as a precautionary measure. This data is sent to the Arduino UNO which communicates with the GPS module to retrieve the location of accident. GPS module uses GPRMC sentences. Once the location is known, Arduino UNO will communicate with GPS module which will send a message containing alert message along with the location of accident, date and time.

IV. SIMULATION AND RESULTS

All the simulations have been carried out with Proteus 8 Professional on Intel(R) Core (TM) i3-3220 CPU @ 3.30GHz. Proteus 8 Professional is a software which can be used to draw schematics, PCB layout, code and even simulate the schematic. It is developed by Lab center Electronic Ltd. The Proteus Design Suite is a Windows application for schematic capture, simulation, and PCB (Printed Circuit Board) layout design. The micro-controller simulation in Proteus works by applying either a hex file or a debug file to the microcontroller part on the schematic. It is then co-simulated along with any analog and digital electronics connected to it. We have simulated the interfacing of various sensors with Arduino UNO separately along with interfacing GSM and GPS module with Arduino UNO.

A. Interfacing LCD with Arduino UNO:

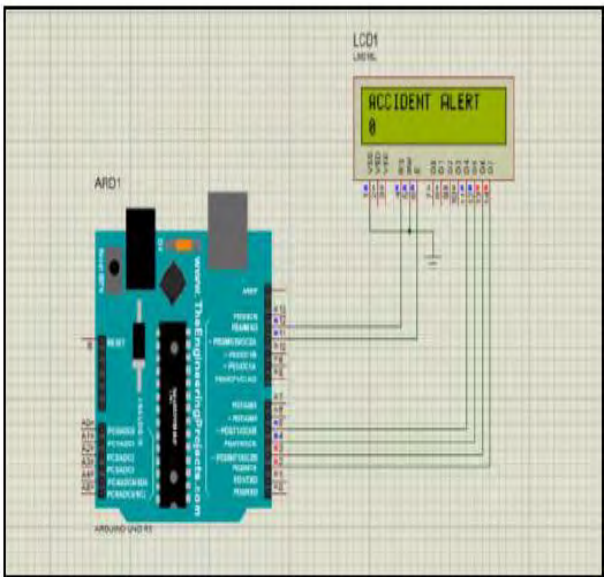


Figure 3 - Interfacing LCD with Arduino UNO

The 16x2 LCD is interfaced with Arduino to display different messages when the accident takes place. As in this simulation, it shows the message “ACCIDENT ALERT”. We can also program the Arduino to display the impact speed, location of vehicle and temperature within the vehicle when it faces an accident on the LCD. The Arduino UNO collects data from the different sensors to be shown on the LCD screen.

B. Interfacing Flame Sensor with Arduino UNO:

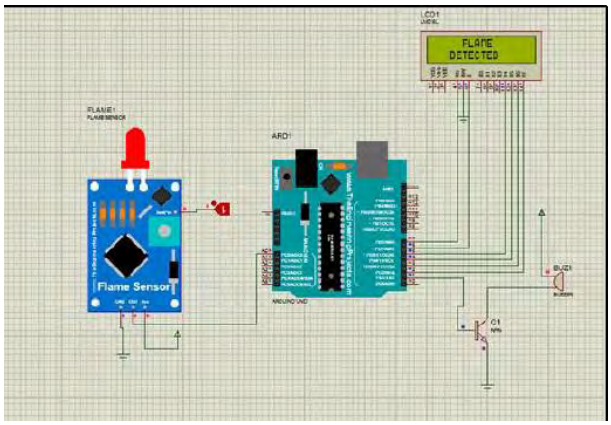


Figure 4- Interfacing Flame Sensor with Arduino UNO

The flame sensor is interfaced with Arduino UNO. The Flame sensor will detect if fire ignites in the vehicle and thus ring the alarm. The Arduino will then send this data to the GSM module which will send fire alert to the respective emergency facilities. In case of simulation on proteus 8 software, when toggle "1" is given it shows as if fire is detected and when toggle "0" is given, it already shows no output.

C. Interfacing LM35 sensor with Arduino UNO:

The temperature sensor will give a warning alarm when the temperature within the car exceeds 50 degree Celsius. This could be an indication that a fire could start within and hence can be prevented by the emergency services like fire department. The temperature within the car is monitored by the LM35 sensor and sent to the emergency services.

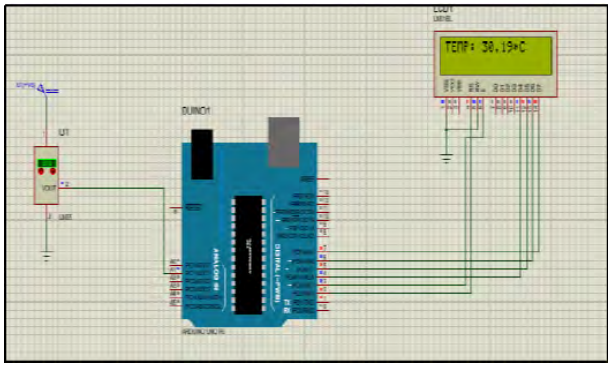


Figure 5- Interfacing LM35 temperature sensor with Arduino UNO

D. Interfacing Vibration Sensor with Arduino UNO:

The vibration sensor is used to detect the impact of the vehicle and hence is a crucial part of this project. The detected impact is sensed by the vibration sensor which immediately sends signal to the Arduino, which will further pass the data to the GSM module to send the alert message. In case of simulation in Proteus 8 software, when toggle "0" is given, it interprets no vibration is detected and when toggle "1" is given it detects vibration.

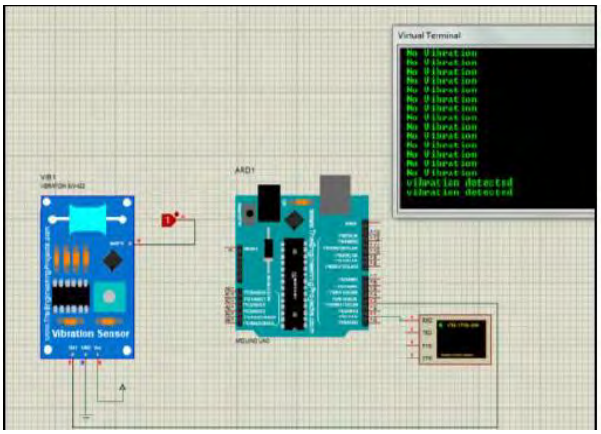


Figure 6 – Vibration detected by the sensor (toggle "1")

E. *Interfacing GSM and GPS module with Arduino UNO:*

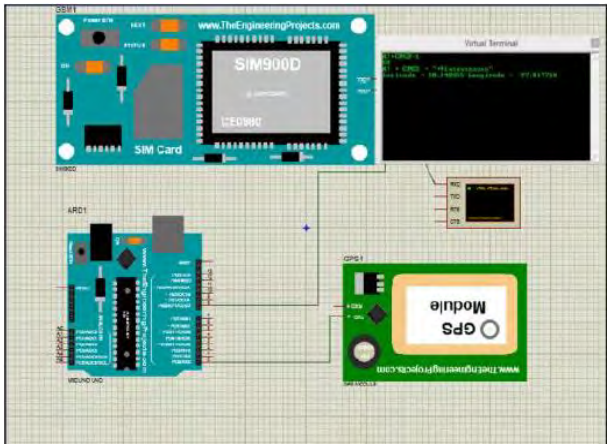


Figure 7 - Interfacing GSM and GPS module with Arduino UNO

The GSM module will show the coordinates where the accident has taken place and the GPS module will use the data collected by the sensors with the help of Arduino to send the alert messages to the emergency services. The GSM module uses AT commands to access the SMS service.

V. CONCLUSION

Automatic Vehicle Accident Detection and Alerting system makes better fleet management and which in turn brings large profits. Better scheduling or route planning can enable you to handle larger loads within a particular time. Vehicle tracking both in case of a personal as well as business purpose improves safety and security, communication medium, performance monitoring, and increase productivity. So, it is going to play a significant role in our day to day living. The main motto of the accident alert system project is to decrease the chance of losing life in such an accident that can't stop from occurring. Whenever an accident is alerted the paramedics are reached to the particular location to increase a chance of life. This device invention is much more useful for the accidents that

occurred in deserted places and midnights. This vehicle tracking and accident alert feature plays a much more critical role in day-to-day life in the future.

VI. SCOPE OF PROJECT

- Rapid incident detection i.e., the vehicles which have undergone to an accident can be identified by using tracking technology without any delay.
- We can monitor some parameters of the vehicle like overheat or LPG gas leakage. We can dial an emergency call if the vehicle goes out of a certain/pre-decided track.
- This system can be interfaced with a vehicle airbag system that prevent vehicle occupants from striking interior objects such as the steering wheel or window.
- Since the system is stationary relative to the vehicle during the collision is possible to use the data gathered to recreate and model the force it experienced during the accident by investigators such as police and insurance.

REFERENCES

[1] Vardhani Radhakrishnan, Smart Vehicle Accident Detection System, November 12, 2018, Accessed on: July 12, 2020. [Online]. Available: https://innovate.mygov.in/innovation/smart-vehicle-accident-detection-system/

[2] R. Kannan, R. Nammily, S. Manoj, A. Vishwa, “Wireless Vehicular Accident Detection and Reporting System”, International Conference on Mechanical and Electrical Technology, vol 2, issue 10, (ICMET 2010).

[3] H. M. Sherif, M. A. Shedid and S. A. Senbel, "Real time traffic accident detection system using wireless sensor network," 2014 6th International Conference of Soft Computing and Pattern Recognition (SoCPaR), Tunis, 2014, pp. 59-64, doi: 10.1109/SOCPAR.2014.7007982.

[4] Spurti Shinde, Shweta Joshi, Nikita Shah3, Shweta Tatiya, Preeti Kumari,” Accident Detection and Alert Systems for Immediate Emergency Services” International Journal of Science and Research (IJSR), vol 4, issue 10, pp.1-4, 2015

[5] M. Syedul Amin, J. Jalil and M. B. I. Reaz, "Accident detection and reporting system using GPS, GPRS and GSM technology," 2012 International Conference on Informatics, Electronics & Vision (ICIEV), Dhaka, 2012, pp. 640-643, doi: 10.1109/ICIEV.2012.6317382.

[6] Bharath P, Saravanan M, Aravindhan K; “Literature Survey on Smart Vehicle accident prediction using machine learning algorithm”, International Research Journal of Engineering and Technology (IRJET), Volume: 06 Issue: 02 | Feb 2019

This page is kept blank intentionally

RFID and GSM Based Attendance Monitoring System

Yash Pandey
E&TC TCET Mumbai, India
yashpandey2202@gmail.com

Aayush Gupta
E&TC *TCET Mumbai, India*
aayushgupta1018@gmail.com

Rishabh Kakani
E&TC TCET Mumbai, India
rishabhkakani720@gmail.com

***Abstract*— Due to challenges of the manual method of taking attendance at schools or colleges, an automated attendance system needs to be adopted. The challenges include difficulty in keeping the attendance list over a period of time, unnecessary time wastage in getting the accurate number of attendees, coupled with improper documentation as students insincerely writing for an absentee among others. This paper implements Radio Frequency Identification (RFID) student attendance monitoring system which provides the functionalities of registering students and recording attendance. On the point of passing into the lecture room, the students have to register their attendance using own personal RFID tag. The RFID reader then reads and transfers the code of the respective tags to the controller. It compares the tags code with database stored in the microcontroller and access command is displayed on the LCD. A GSM module is incorporated in the system which provides a messaging platform for informing parents/guardian of students of their ward attendance in schools or colleges.**

Keywords—Radio Frequency Identification (RFID), Global System for Mobile Communication (GSM), RFID Tag/Card, RFID Reader, Arduino controller

I. INTRODUCTION

The technologies considered for this paper are RFID and GSM. The basic mechanism behind working of RFID is wireless use of electromagnetic fields. These fields are used to transfer data. The objects are automatically identified by tracking tags attached to them. These tags are nothing but information stored in electronic form. There are two types of tags.
The first type are the tags which work on electromagnetic induction, the second type work on the radio waves. First type creates magnetic fields near the sensor and the other type acts as a passive transponder. Other tags take power from a battery and can be operated far away from the sensor. The other module, GSM, is mostly used by digital cellular networks and mobile phones.
The basic network structure of GSM includes a base station a network and switching sub system, GPRS core network, one operations support system (OSS). The microcontroller we used in this system is a LPC2148 microcontroller. It consists of an ARM 7 microprocessor. The programming related to this system is done in embedded C programming language. The specifications of this microcontroller are maximum speed: 30 MHz. The Voltage is 3.3V.

II. CIRCUIT DAIGRAM

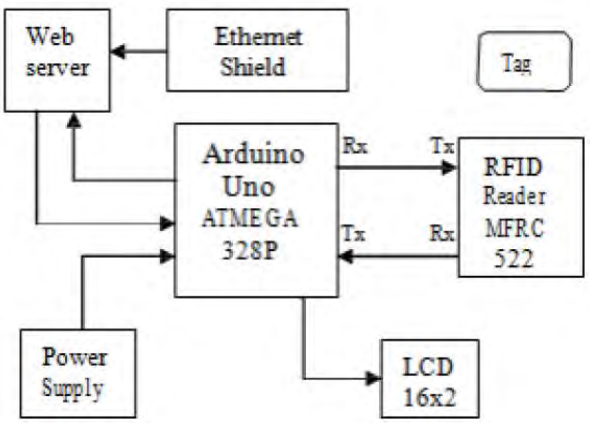


Fig. 1.Block Diagram

III. LITERATURE SURVEY

- Each student has RFID tag attached with their Student ID card. There is a serial connection amid computer and RFID reader also has been maintained for connection between RFID and the computer system. The RFID reader is placed at the lecture hall door. Whenever students enter the lecture hall RFID reader read the RFID tag and it store the all information (Entry time, Name, etc.) of students into database via serial connection and maintain the system. Here admin of this system can view all documents using the software interface by retrieving information from database without any difficulties not like traditional system.
- Both RFID Reader and tag contains Transmitter and receiver antenna respectively. When the student carrying card /tag will come in the range of RFID Reader, the reader will read the data of that tag. The system will compare or verify the information with the database. If the information will match with the database, the LCD on the system will display the authentication message. At the same, the parents will be notified via SMS. If the information will not match with the database, the LCD will display unauthorized entry. The database will be designed by using PHP, which contains login options for Parents, teachers and others. The main work of database is to store the attendance data of students, which will then use to

check the attendance records of students. It is more advantageous over GSM system, because GSM system requires reprogramming many times for notification to the parents. Therefore, database server will be implemented instead of GSM system.

- Whenever the student shows his RFID card the data on the card is displayed on the lcd and the door of the class opens, if the RFID card matches with the database, student enters the class and the door closes. This repeats till the faculty enters by showing the corresponding RFID card, once the faculty entered the class the door is locked and no student is allowed to come in or to go out. The system checks the absentees and sends the message to the parents, class admin using the GSM modem.

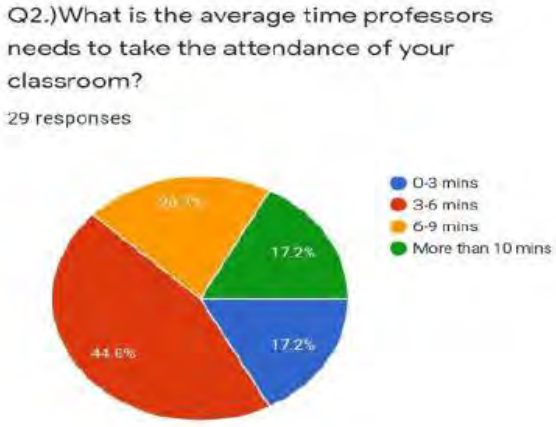
IV. PROBLEM DEFINATION

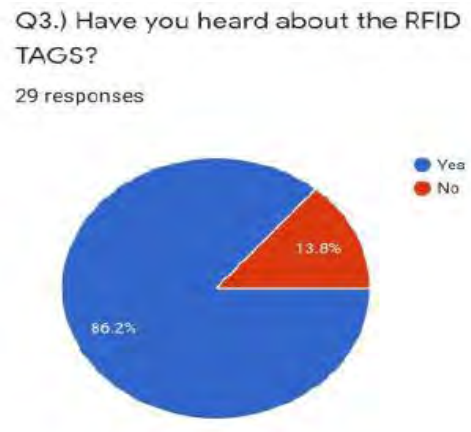
- In school, student irregular attendance is major issues which can effect on his academic performance, taking attendance in conventional way like by calling roll number or by signing on paper is very tedious and time consuming.
- On other hand when child leaves home for school parents get worried whether the child reached at school or not.
- RFID based E- attendance and child security system can be used as solution to both problem.
- RFID radio frequency identification secure system which uses electromagnetic waves to identify the object carrying tag.

V. PROPOSED METHODOLOGY

- First of all, the initial programming will be done in the system. Both RFID reader and tag contains Transmitter and receiver antenna respectively.
- When the student carrying card/tag will come in the range of RFID reader, the reader will read the data of that tag. The system will compare or verify the information with the database. If the information will not match the database, the LCD on the system will display the authentication message. At the same, the parents will be notified via SMS
- If the information will not match the database, the LCD will display unauthorized entry. The database will be designed by using PHP, which contains login options for Parents, teachers and others.
- The main work of database is to store the attendance data of students, which will the use to check the attendance records of students.
    - We will be using GSM system in which it requires reprogramming many times for notification to the parents.

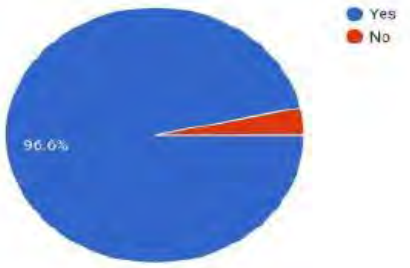
VI. SURVEY





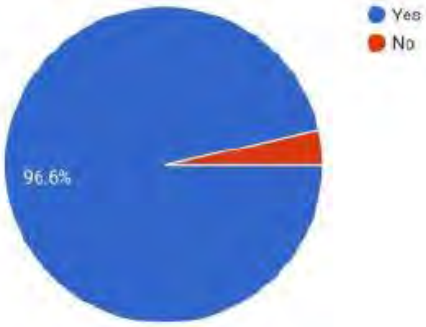
Q4.) Do you think that the automatic/RFID tagging attendance is better than taking attendance manually?

29 responses



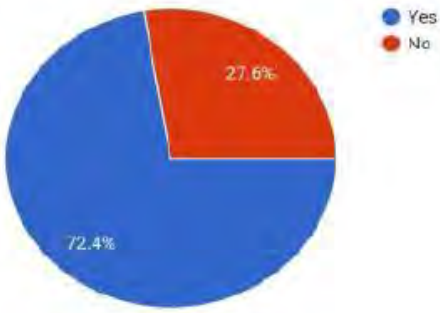
Q5.) Would you like to have an automatic/RFID tagging attendance system?

29 responses



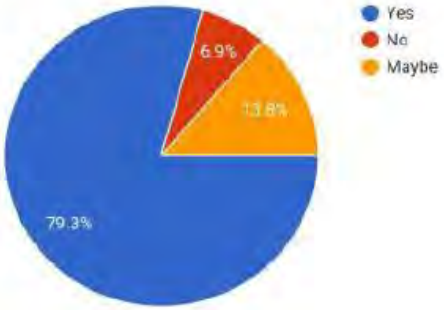
Q6.) Have you heard about RFID and Gsm cards?

29 responses



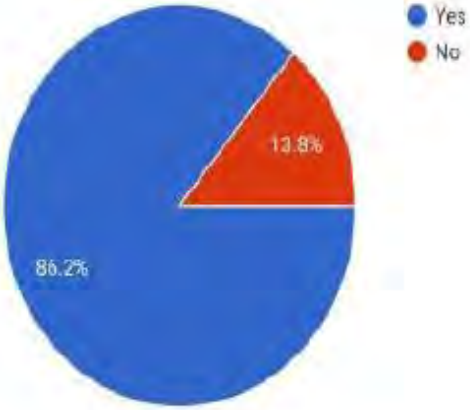
Q7.) Do you think automatic attendance will help the colleges/schools to maintain a proper record of students?

29 responses



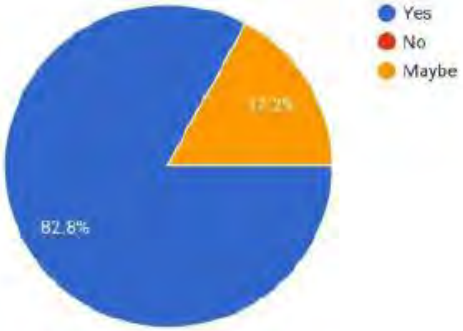
Q.8.) Will it help knowing about the upcoming lectures?

29 responses



Q9.) Do you think it will be easy to track your own attendance?

29 responses



VII. ACKNOWLEDGMENT

We would like to thank E&TC department and our faculty members for giving us this opportunity to research and design project. Final thanks to Thakur College of Engineering and Technology for giving us this Platform

VIII. CONCLUSION

From this analysis we could identified that Radio Frequency Identification (RFID) is a very advanced technology for automatic attendance system and it provide very higher accuracy and speed than a traditional paper-based system.

Eventually from this study we got to know that each and every system we discussed has its own advantages and disadvantages. Some characteristics are good for some system and some are not. To overcome this, a hybrid model is necessary and which merely provide higher efficient system without any disadvantage.

IX. NOVELTY IN THE PROJECT

Prices of the existing products in the market are bit higher than our proposed product.

We are implementing just Arduino and rfid tags and Scanner and avoiding gsm module to reduce the cost

REFERENCES

[1] S. Abdinia, A. H. M. van Roermund, and E. Cantatore, "RFID Tag," 2015, pp. 113– 121.

[2] Dhrubajyoti Adak, Manoj kumar Pain, Uttam kumar Day, "RFID Based security System using Arduino", International Journal of Science & Engineering research, 2017.

[3] Mahesh Sutar, Mahesh Patil, Sachin Waghmare, "Smart Attendance System Using RFID in IOT", International Journal of Advanced research in computer Engg. & Technology- 2016.

[4] RFID-Based Students Attendance Management System by Arulogun O. T., Olatunbosun, A., Fakolujo O. A. Engineering Research Volume 4, Issue 2, February-2013

Indoor Navigation System for Smartphone using Wireless Hotspot

Adarsh Singh
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
adarshsingh19011999@gmail.com

Aman Sahu
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
sahuaman530@gmail.com

Vaibhav Yadav
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
yvaibhav0509@gmail.com

Vinitkumar Dongre
Professor
Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
vinit.dongre@thakureducation.org

***Abstract*— The indoor navigation is a system is used to locate the exact location inside hospitals, malls, museums etc. The outdoor navigation is based on GPS while in indoor navigation GPS cannot be used due to attenuation of signal from physical objects. Indoor navigation/positioning method is mainly based on Wi-fi fingerprint for large areas. In this method location of the user is obtained using RSSI measurements from Wi-Fi access points, it consists of two phases. During offline phase finger prints are collected at known position and stored in database which is called as radio map. While in online mode, present Wi-fi fingerprint is compared with the radio map through which user location is calculated. From this project the user will able to navigate in indoor system and find the shortest route, Also the user will not have to install android application it will be based on web application.**

Keywords— indoor navigation, RSSI, Wi-fi fingerprint, radio map

I. INTRODUCTION

The availability of wireless technologies and other technologies like internet and mobile computing this all leads to new opportunities for making and developing new computer and mobile applications which makes people's life easier. Navigation system plays a very vital role and becoming more important in our daily life's routine to make our life more comfortable that's why researchers have been working to make our mobile not only a communication tool but also a navigation tool.

GPS that is Global Positioning System plays a vital role in determining position of the user and routing a person to reach his or her destination. GPS uses satellites to triangulate the location of the device. This technology has made a very good impact in terms of accuracy and the location which has been preferred based on outdoor positioning. But when it comes to indoor positioning environment, this system has proved to be ineffective and incapable. Hence when it comes to indoor positioning system there are alternatives such as WIFI, Bluetooth, Infrared Red and RFID are more preferable. In rest

of the paper, we will talk about our strategies, planning and implementation of our project.

Basically indoor positioning service can be provided both by using Wi-Fi and beacons. It is based on the need to use Wi- Fi or beacons. Where there is a need for very high precision, but in large regions or campuses, beacons are basically favoured. We should not prefer beacons because they need to be built in close proximity to each other, making their use inexpensive and impractical. The downside to using Wi-Fi is that the location's precision relies solely on the signal intensity that can occur occasionally, but with recent technical advances, Wi-Fi speed and SDKs (software development kit) it is a problem that can be tackled or overcome easily. Due to its ease of use, Wi-Fi is also a popular feature for indoor positioning systems. The wi-fi signal's average range is 5 to 15 meters, allowing devices inside a building to quickly access IPS services for better navigation provided by the building. Wi-Fi is the most common technology for wireless connections and for any smartphone or device it comes pre- built. In rest of the paper, we will talk about our strategies, planning and implementation of our project.

II. EXISTING INDOOR NAVIGATION SYSTEMS

S.Verma, R.Omanwar, V Sreejith and G.S Meera[1] Accuracy can be improved using real-time Techniques. It would extend to include Near-Field communication (NFC tags) or QR Codes at entrances or by incorporating the last received GPS coordinate before the application switches to the indoor navigation module. In this method is supported by a web-based interface for users to easily create a map of any indoor location by taking panoramic images. In order to localize and guide the user to a destination using the shortest path, a smartphone application can request map information from the web server. The user will able to navigate using the smartphone. As the user enters the destination location image of the location is displayed to enhance the user experience C.Yara,Y. Noriduki,

S.Ioroi and H. Tanaka[2] Accurateness of the position system might be still improved by the appropriate deployment and proper number of fixed wireless receivers. Positioning information is absolutely key for the operation of location- based services. The effective collection, preservation and visualization of such information is necessary to expand their information toward the application system. The requirements for a platform that handles map information and provides position information to application systems such as navigation systems are application server and data management. INS provides the ability to monitor location data on people or items indoors in real time using sensory information from automated devices. Hence, naturally increasing in customer intimacy and demand of location-based services the use of INS is quite obvious.

A.H Lashkari, B.Parhizkar and M.N.A . Ngan [3] The drawback of the WLAN system is that the user's location can be skewed if an A.P(access point) is incorrect or has been removed. In this method, it consists of on-line mode and online mode. The offline phase includes creating a radio map. The radio map, would include distributions of Received Signal Strength (RSS) values from all detected Access Point (AP) at specific points which are known as marking positions. The accurateness of the indoor navigation will improve and with less amount of time people can reach their destination.

W. Joanne, S. Taking, N. Isa and K. Chao [4] In this report the methodology is partitioned into five easy steps, that are, Indoor Map Design, Selecting Implementation Technology, Indoor Localization Development, Indoor Navigation Integration and Output Feedback Display. We have found GPS cannot be used because the signals get scattered and attenuated by physical objects. It's based on application Wi- Fi access points found abundancity in smartphone and building. In this project the power consumption, accuracy and speed were taken care and Various test were performed by changing the algorithm to lower the power consumption.

III. FINGERPRINTING METHOD FOR INDOOR NAVIGATION

In indoor, GPS cannot be used for navigation because the signals get scattered and attenuated by physical objects. For indoor navigation Bluetooth beacons and Wi-fi based technology is used, Bluetooth beacons are low energy transmitter hardware that broadcast their identifier to nearby portable devices. Bluetooth beacons are used for small indoor areas and cannot be used for large areas while when compared to Wi-fi based technology it can be used for large indoor areas and most of the malls, hospitals and building have preexisting Wi-fi LAN which can help to reduce the cost. Based upon the area, if it's is large then location of the user can be determined using Wi-fi based technology. Indoor Positioning technology can be divided into two fields one is based on 2Dmodel & other is 3D model. The 2D model uses Bluetooth, Wi-Fi as positioning signals and 3D model uses Infrared, Ultra- wideband, Ultrasonic.3D model mostly uses Time of Arrival, Angle of Arrival & other methods based on time and space attributes. These types of technology require additional hardware which increases the costs. Compared to 3D model technology, the hardware used in 2D model-based positioning technology is much smaller, which would effortlessly drive down the prices. It is the role of a Wi-Fi wireless network access point to measure the strength of radio frequency signals. Therefore, using Wi-Fi & some algorithms, we can use mobile devices, tablets etc. to achieve indoor positioning.

Wi-Fi based positioning system: With the large distribution of Wi-Fi, the business demand of indoor positioning technology has significantly increased It has become an area of considerable interest in indoor positioning technology research because of its high accuracy, low power consumption, and low cost..There are two types of Wi-Fi- based positioning technologies: time and space attributes of received signal (TSARS)-based technology which mainly uses TOA, AOA, TDOA and received-signal strength based positioning technology. Received-signal strength (RSS): There are three methods based on this technology, Approximate Perception: The system of approximation perception (AP) is a relatively basic method that uses the best base station as the criterion for placement. But it has slow precision of about 100m. Trilateration: Trilateration is the more common method for position calculations. Trilateration uses the known distance from at least three fixed points in 2D space or four fixed points in 3D space (as if on the surface of the Earth) to calculate the position of an object. The system of trilateration operates by locating the intersection of a set of rings (imagine a Venn diagram). Trilateration method uses three or more APs to send signals received by the mobile device. The study contains of two main stages; the first stage is distance estimation. In this stage, the distance between Access Point and the mobile device is obtained by Received Signal Strength (RSS) values similarly from 4 access points by signal propagation model. In the 2ND stage, the location of the mobile phone is calculated by 4 distances via trilateration algorithm. Wi-Fi signals are very sensitive to noise between the connection point and the mobile unit, so the approximate distances are very unreliable, even in the LoS region. The distance between the transmitter and the receiver can not be properly determined due to errors in the RSSI, resulting in improper location estimation.

Three or more APs are used by the trilateration system to transmit signals received by mobile devices and translate them into spatial distance, which is used as the circle radius (whose centre is AP) and the measured user position is the intersection of the three circles. Scene Analysis: It is also known as the matching of fingerprints. It varies from other strategies because it does not require the AP's position in advance. Since scene analysis has the features of low-cost, high-precision, and low-energy consumption, this method has been of great significance. The interpretation of the scene depends on the signal strength and the signal intensity of different APs is calculated at the same reference point (RP) in order to obtain the RPs' strength information. We may obtain data on the RP, also called a fingerprint, in

conjunction with basic coordinate information and the MAC (Media Access Control) address of the RP. Usually, scene analysis is broken into two steps. The first phase is the offline acquisition phase where the main task is to establish a fingerprint database. The second phase is called the online phase. Researchers use real-time receiving signal intensity determined by mobile devices in this process to find a fingerprint that often fits the measurements in the database by complex matching algorithms to obtain the user's appropriate location

In the offline phase the RSSI values and MAC addresses from APs are collected to make database. For large areas like playground values are collected by dividing the, the indoor environment (area of interest) into grid system and at each grid corner the value is noted. Each grid point is called as Reference Point (RP). The RSSI value keeps on changing, maximum number of samples is collected which is arranged in the descending order. For the straight paths, the starting and the end point of the path is noted and a link is formed, then the link is divided into equidistance points and at every point the RSSI and MAC values are collected. To calculate the power level that an RF client computer receives from an access point or router, RSSI is used. The higher the frequency of the RSSI, the greater the signal. The RSSI signal value of 0 (zero) to - 120 is calculated in decibels. RSSI valve can be obtained using Wi-Fi scanner applications. Along with this method different filter are used such as signal filter, delay filter, an adaptive filter and k-weighted nearest algorithm to improve the accuracy of the system and Dijkstra's algorithm is used for path finding route.

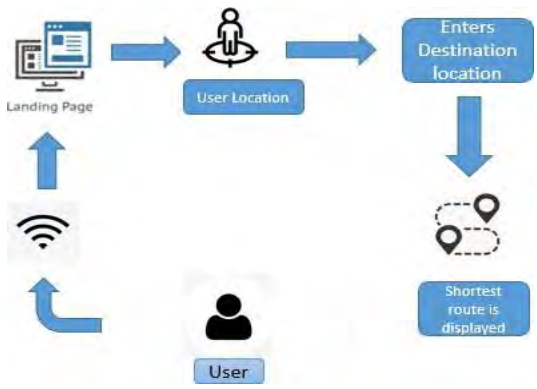


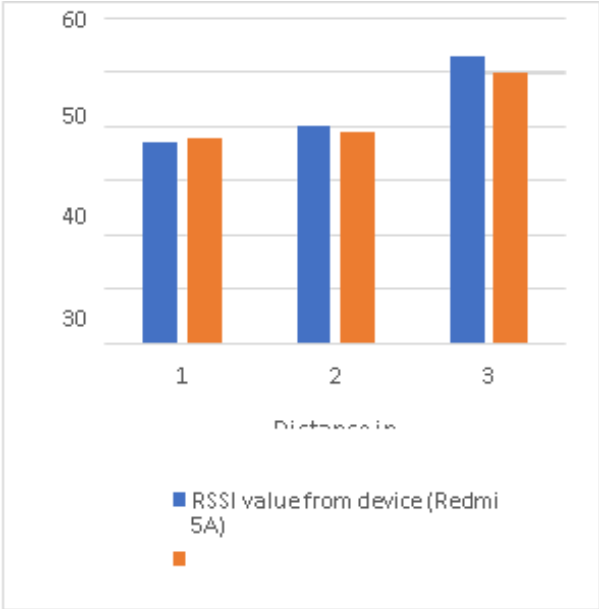
Figure 1: Block diagram of INS using wireless hotspots

IV. RESULT

This project is carried out under COVID-19 pandemic situation, so the readings were taken in two different indoor location and the tool used for getting the readings is IP Tools Wi-fi Analyzer. The RSSI values keeps on changing, so to get accurate readings multiple readings should be taken, in these four readings were taken and the final value is got by taking the mean of all the values.

In indoor environment no 1, RSSI readings were taken from two different devices and also the distance from the router to phone was calculated. From the table no 1 and graph is observed that the signal strength is approximately same and also in some cases value is different because the orientation of phone and holding the device can also affect the readings.

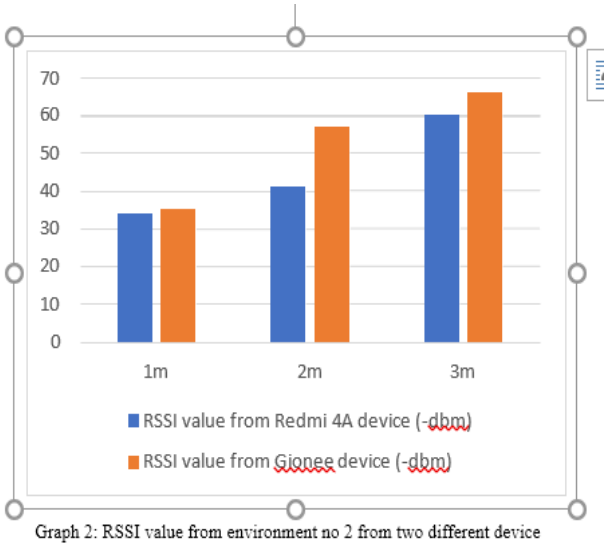
Graph 1: RSSI value from environment no 1 from two different device



No. of readings	RSSI value from device (Redmi 4A) (dbm)	RSSI value from device (Gionee P7)	Distance from router to phone(meters)
1	-34	-35	1
2	-41	-57	2
3	-60	-66	3

No. of readings	RSSI value from device (Redmi 5A) (dbm)	RSSI value from device (Realme 6i)	Distance from router to phone(meters)
1.a	-21	-20	0
1.b	-22	-22	0
1.c	-22	-25	0
1.d	-21	-23	0
1	**-21**	**-23**	**0**
2.a	-34	-36	1
2.b	-35	-37	1
2.c	-37	-38	1
2.d	-40	-40	1
2	**-37**	**-38**	**1**
3.a	-38	-39	2
3.b	-40	-38	2
3.c	-39	-39	2
3.d	-41	-40	2
3	**-40**	**-39**	**2**
4.a	-53	-48	3
4.b	-56	-49	3
4.c	-50	-52	3
4.d	-51	-51	3
4	**-53**	**-50**	**3**

Table 1: RSSI value from environment no 1 from two different device



Graph 2: RSSI value from environment no 2 from two different device

In indoor environment 2, using same tool but with different devices RSSI readings were taken, almost the values are same except in second reading due to phone orientation or obstacle. From both the tables it observed that RSSI values are same from both devices are same, using different devices does not affect the readings, if more no. of readings is taken in offline mode then error can be minimized.

V. CONCLUSION

In this project, indoor navigation system is supposed to be build using Wi-fi based technology using Fingerprinting technique also using of filters and algorithms for better performance. Instead of going with android application, web application is preferred by going with this user will not have to install the application, as the user enters the location and connects to the access point the users gets directed to the landing of the application & using that users can easily navigate.

VI. FUTURE SCOPE

The user will able to find the shortest route and navigate through it using smartphone using access point also with simple user interface. At the door of entrance, it can be incorporated with QR codes with position of the user and the web page link. It can used in hospitals and malls etc.

REFERENCE

[1]. Shivam Verma, Rohit Omanwar, Sreejith V, Meera GS "A Smartphone Based Indoor Navigation System", IEEE 2016 28th International Conference on Microelectronics (ICM), Dec. 2016.

[2] Chokatsu Yara, Yuta Noriduki, Shigenori Ioroi and Hiroshi Tanaka, "Design And Implementation Of Map System For Indoor Navigation", Kanagawa Institute of Technology, Information Faculty 1030 Shimo- ogino, Atsugi-shi,Kanagawa, 243-0292, Japan, 2015.

[3] A. H. Lashkari, B. Parhizkar and M. N. A. Ngan, "WIFI-Based Indoor Positioning System," 2010 Second International Conference on Computer and Network Technology, Bangkok, Thailand, 2010, pp. 76-78, doi: 10.1109/ICCNT.2010.33.

[4] W. Joanne, S. Taking, N. Isa and K. Chao, "Indoor navigation and localisation application system," 2016 3rd International Conference on Electronic Design (ICED), Phuket, Thailand, 2016, pp. 327-331, doi: 10.1109/ICED.2016.7804661.

[5] M. Garcia, C. Martinez, J. Tomas and J. Lloret, "Wireless Sensors selflocation in an Indoor WLAN environment", International Conference on Sensor Technologies and Applications, pp. 146-151 (2007).

[6] Y.Li, P. Zhang, X. Niu, Y. Zhuang, H. Lan, and N. El-Sheimy, "Real- time indoor navigation using smartphone sensors," in Indoor Positioning and Indoor Navigation (IPIN), 2015International Conference on, Oct 2015, pp. 1–10.

[7] Shixiong Xia, Yi Liu , Guan Yuan , Mingjun Zhu and Zhaohui Wang," Indoor Fingerprint Positioning Based on Wi-Fi ",International Journal of geo information,28 April 2017.

[8] Litao Han, Li Jiang, Qiaoli Kong,Ji Wang, Aiguo Zhang,and Shiming Song," Indoor Localization within Multi-Story Buildings Using MAC and RSSI Fingerprint Vectors", NCBI journal, sensors MDPI, PMCID: PMC6603617, 2019 May 28. doi: 10.3390/s19112433.

[9] Dongsoo Han, Suk-Hoon Jung, Minkyu Lee,Giwan Yoon," Building a Practical Wi-Fi Based Indoor Navigation System" IEEE Pervasive Computing (Volume: 13, Issue: 2, Apr.June. 2014), DOI: 10.1109/MPRV.2014.24.

A Three Port Microstrip-Fed Antenna for UWB-MIMO Diversity Applications

Raj Kumar
Microwave and RF Division
ARDE, Homibhabha Road, Pashan, Pune-21
dr.rajkumarkumar@yahoo.com

Pramod Dhande
Microwave and RF Division
ARDE, Homibhabha Road, Pashan, Pune-21
pramoddhande@arde.drdo.gov.in

***Abstract* - In this paper a three port antenna for polarization diversity applications is designed and proposed. The antenna system consists of three different antennas. Out of these, two antennas are placed in a plane while third is placed orthogonal to earlier. The size of the overall system is 57 mm x 58 mm. The measured impedance bandwidth of the antenna system is 3 GHz-13 GHz. The isolations between the ports are 15 dB or better in most of the bands. Further, the radiation patterns, peak gain and the diversity gain of the antenna is also measured and presented. The measured and simulated results are in good agreement.**

Keywords-* *Microstrip, Ultra wide band, MIMO and Diversity

I. INTRODUCTION

Nowadays, the wireless communication systems witnessed huge growth. For the high data rate communication larger bandwidth is required. In 2002, the Federal Communications Commission (FCC) released unlicensed spectrum from 3.1 GHz to 10.6 GHz. This drives the researchers to put more efforts to do research on high data rate UWB communication applications like personal area network, satellite communication [1]. Mostly, the wireless communication suffers from channel limitation due to multiple path fading. To counter this problem, Multi-input Multi-output (MIMO) antenna systems are used to improve the range and capacity of a system. The performance of MIMO system depends on the inter element spacing, antenna geometry and number of antenna elements [2]. Further, to optimize the inter element spacing between the radiators along with the antenna size for better performance is a difficult task. Therefore there is a need of compact MIMO antenna system with UWB performance.

In the past many efforts have been made to design MIMO-diversity antenna with compact size [3-10]. In [3], a two port UWB, MIMO/diversity antenna of size 60 mm x 64 mm is designed. This antenna operates in 2.27- 10.2 GHz band. In [4], a three port antenna for MIMO application is designed. The size of the antenna is 68 mm x 50 mm. This antenna operates in two bands. Three port antennas are also designed in the past [11-12]. In [11], a three port antenna for polarization diversity is designed.

The size of the antenna is 140 mm x 140 mm and this antenna operates in 2.4 GHz band. In [12], a three dimensional, three port antenna is designed for MIMO applications. This antenna operates in a narrow 2.55 GHz band.

The size of antenna is 51 x 51 x 51 mm^3. A comparison of different designed planar antennas for diversity application is given in table 1. From the table it can be seen that designed antenna has advantage in terms of either size and or number of ports. In this paper, a compact three port antenna is designed for MIMO-diversity application. The antennas are microstrip fed. Two antennas are placed in a plane and the third antenna is placed orthogonally. This results in to polarization diversity antenna system. The antenna system operates in 3-13 GHz band. The isolations between the ports are better than 15 dB in the operating band. Therefore this antenna system is a potential candidate for compact MIMO system.

TABLE I

COMPARISON OF DIFFERENT DIVERSITY ANTENNA WITH THE PROPOSED ANTENNA

S. No.	Ref.	No. of Ports	Size (mm x mm)	Operational Bandwidth
1	[3]	2	60 x 64	2.27-10.2 GHz
2	[4]	2	56 x 56	3-10.8 GHz
3	[5]	2	60 x 60	2.6-11 GHz
4	[6]	2	50 x 90	1.85-10.6 GHz
5	[7]	2	48 x 48	2.5-12 GHz
6	[8]	2	80 x 80	3-12 GHz
7	[9]	2	80 x 80	3-12 GHz
8	[10]	2	68 x 40	3.2-10.6 GHz
9	Proposed	3	57 x 58	3-13 GHz

II. ANTENNA DESIGN

The geometry (front and back view) of the three port antenna system is shown in Fig.1. The antenna is designed on a FR-4 substrate of thickness 1.6 mm. The dielectric constant of the substrate is 4.4 and the loss tangent is 0.02. In the design, first port of the antenna system is a horizontally polarized microstrip fed slot antenna. The slot in the ground plane is of three stepped structure such that the centre of the slot is narrow while the outer part is wider. This slot is excited by a stepped

fed line. The geometry of the fed is such that the centre of the fed is narrower than the outer. The end of the fed line is terminated on a square patch for maximum impedance matching. With this, ultra wideband impedance bandwidth is achieved [13]. For the second port of the antenna system, the antenna is placed orthogonally to the earlier designed antenna. This antenna is a microstrip fed structure. The radiating element is trapezoidal patch. This patch is fed by a tapered feed line for maximum impedance matching. The ground for this antenna is a rectangular shaped blend by radius R_1 at one corner. This also improves the impedance matching. For the third port of the antenna system, a microstrip fed antenna is placed in the plane of the first port antenna. The radiating element of this antenna is a semi circular disc shaped patch. This patch is excited by a tapered shaped feed line for maximum impedance matching. The ground plane for this antenna is also a modified semicircular in shaped. This shaped and its radius is optimized for maximum impedance matching. To form a diversity antenna system, the three antennas are arranged such that the impedance bandwidth performance of the individual antennas does not deteriorate and the achieved isolations between the different ports are large.

To achieve maximum isolation between the ports, the antennas are separated by some distance. These distances are optimized for better isolations. To understand the achieved isolation due to separating the antennas by some distance, current distribution at 5 GHz is shown in Fig. 2 for single port excitation at a time. From the figure it can be seen that, when port 1 is excited, the current only content in antenna 1 and a negligible amount of current flows in the other two antennas. Similarly, in case of only excitation of either port 2 or port 3 the currents flows in the other antennas are negligible. Therefore, it can be said that by separating the antennas high level of isolations between the ports are achieved. Finally the parameters of the all antennas are optimized after excitations of all the three ports simultaneously for maximum impedance bandwidth and better isolation between the ports. The optimized dimensions are given in Table 2.

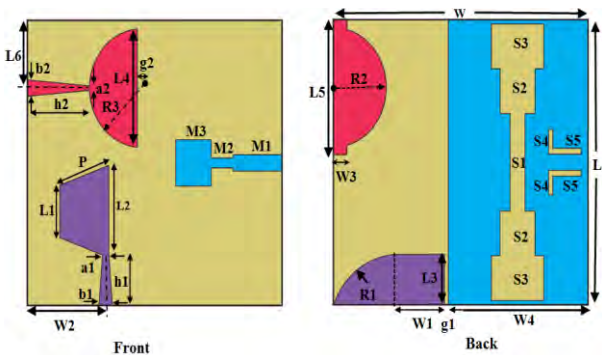


Fig. 1. Schematic of the proposed three port antenna system for MIMO-diversity application

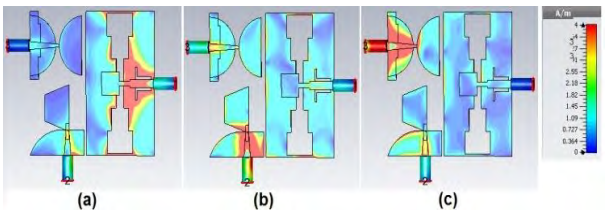


Fig. 2. Current distribution at 5 GHz for (a) Only port 1 is excited (b) Only port 2 is excited (c) Only port 3 is excited

TABLE II

OPTIMIZED DIMENSIONS OF THE PROPOSED ANTENNA SYSTEM IN MM

Parameter	M_{1L}	M_{2L}	M_{3L}	M_{1W}	M_{2W}	M_{3W}
Value	3.2	1.9	9.25	11.1	5	8.1
Parameter	W_1	W_2	W_3	W_4	L_1	L_2
Value	10.46	17.48	3	31.8	10.5	18
Parameter	L_3	L_4	L_5	L_6	R_1	R_2
Value	10	23.7	27	13.5	16	12
Parameter	R_3	a_1	a_2	b_1	b_2	g_1
Value	11.9	1.4	0.8	3	3.2	0.9
Parameter	g_2	h_1	h_2			
Value	1	10	14.1			

III. RESULTS AND DISCUSSIONS

The antenna is fabricated with optimized dimensions. The fabricated prototype of the antenna is shown in Fig. 3. The reflection coefficients and isolation between the ports of the antenna are measured using R&S vector network analyzer ZVA 40. Fig. 4 shows a comparison of measured reflection coefficients of the three ports. From the figure it can be seen that, for excitation of port 1, the antenna has an impedance bandwidth from 3 GHz to 13 GHz. For port 2 excitation the impedance bandwidth of the antenna is from 2.8 GHz to beyond 15 GHz except some point where the reflection coefficient is greater than -10 dB. For port 3 excitation, the antenna has an impedance bandwidth is from 2.2 GHz to 14 GHz except some point where the reflection coefficient is greater than -10 dB. A Comparison of the measured isolations between the different ports is given in Fig. 5. From the figure it can be seen that the isolation between the port 1 and port 2 is better than 15 dB in the operating band. The isolation between the port 1 and port 3 is better than 15 dB in most of the operating band except around 3 GHz. Similarly the isolation between the port 2 and port 3 is better than 15 dB in most of the operating band.

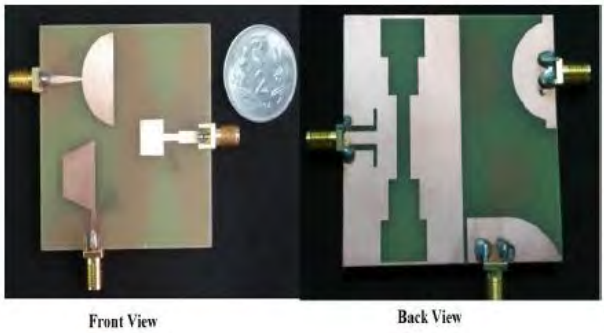


Fig. 3. Fabricated prototype of the proposed three port antenna system

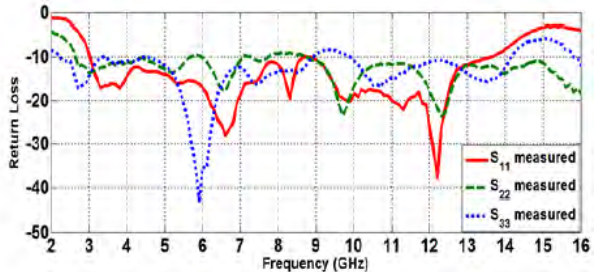


Fig. 4. Comparison of measured return loss at different ports

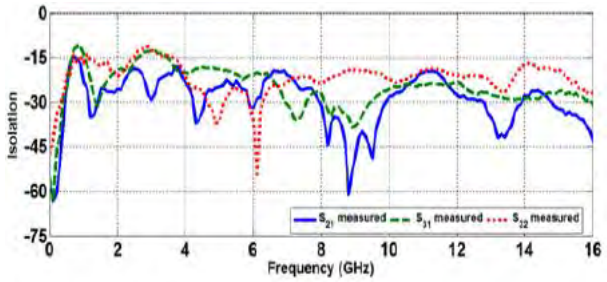


Fig. 5. Comparison of measured isolation between the different ports

The radiation patterns of the proposed antenna are measured in an in-house anechoic chamber in conjugation with a R&S Vector Network Analyzer ZVA 40. The radiation patterns are measured for all port excitation such that only one port is excited at a time. Fig. 6 shows a comparison of simulated and measured radiation patterns in E-plane at different frequencies for different port excitation. Similarly, Fig. 7 shows for H-plane. From both the figure it can be seen that, the measured and simulated patterns are in good agreement.

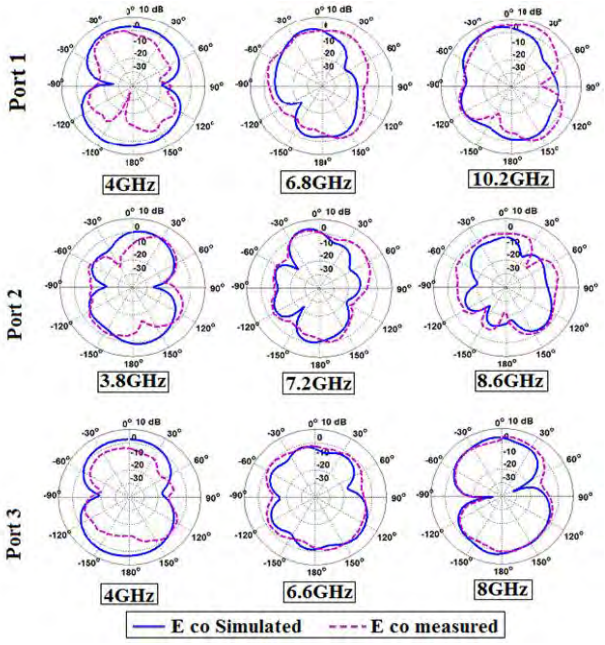


Fig. 6. Comparison of simulated and measured E-plane radiation patterns for different port excitation.

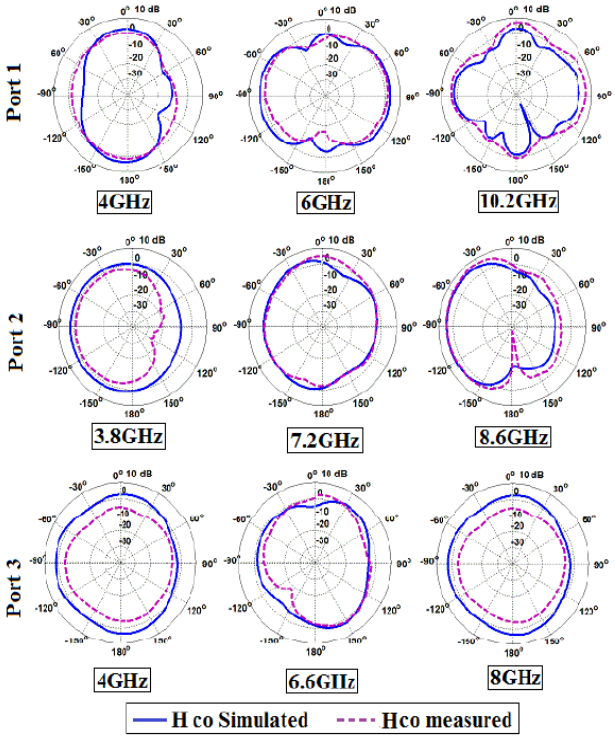


Fig. 7. Comparison of simulated and measured H-plane radiation patterns for different port excitation.

IV. DIVERSITY PERFORMANCE

The diversity performance of an antenna system is evaluated by measuring the diversity gain and the Envelope Correlation Coefficient (ECC) between the different ports. The ECC ρ_e can be calculated by using equation (1-3) using equation mentioned in [12]

$$\rho_e(1,2,3) = \frac{|S_{11}^* S_{12} + S_{12}^* S_{22} + S_{13}^* S_{32}|^2}{[1-(|S_{11}|^2+|S_{21}|^2+|S_{31}|^2)]\,[1-(|S_{22}|^2+|S_{12}|^2+|S_{32}|^2)]} \quad (1)$$

$$\rho_e(2,3,3) = \frac{|S_{21}^* S_{13} + S_{22}^* S_{23} + S_{23}^* S_{33}|^2}{[1-(|S_{21}|^2+|S_{22}|^2+|S_{23}|^2)]\,[1-(|S_{31}|^2+|S_{32}|^2+|S_{33}|^2)]} \quad (2)$$

$$\rho_e(1,3,3) = \frac{|S_{11}^* S_{13} + S_{12}^* S_{23} + S_{13}^* S_{33}|^2}{[1-(|S_{11}|^2+|S_{12}|^2+|S_{13}|^2)]\,[1-(|S_{31}|^2+|S_{32}|^2+|S_{33}|^2)]} \quad (3)$$

The ECCs of the proposed antenna is calculated from S-parameters of the antenna using above three equations. Fig.8 shows the comparison of three different ECCs. From the figure it can be seen that the ECCs between port 1 and port 2 and between port 1 and port 3 are well below 0.002 in the operating band. Also the ECC between port 2 and port 3 is less than 0.002 except at frequency 5 GHz. Fig. 9 shows the diversity gains between the different ports. From the figure it can be seen that the diversity gains are more than 9.98 dB in the operating band of the antenna. Therefore, this antenna shows good diversity antenna property.

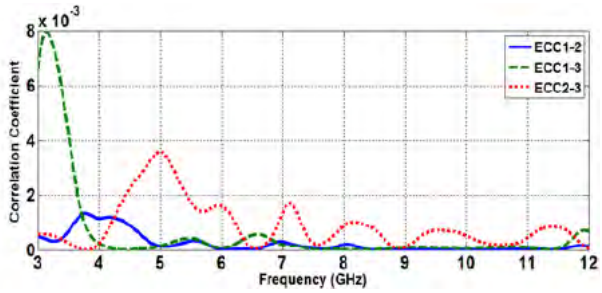


Fig. 8. Comparison of the ECCs between different ports of the antenna

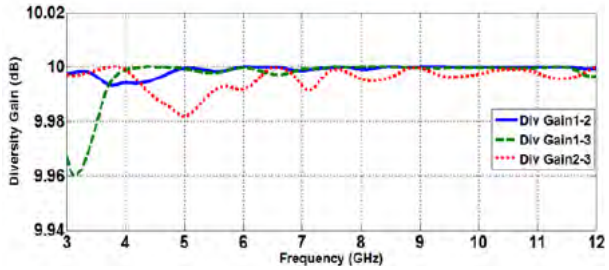


Fig. 9. Comparison of diversity gain of the antenna for different port combinations

V. PARAMETRIC STUDY

In this section, the effect of the two important parameters g_1 (gap between Antenna 1 and Antenna 2) and g_2 (gap between Antenna 1 and Antenna 3) on the antenna characteristics have been studied. Fig. 10 (a) shows the effect of the g_1 on the return loss of the port 1. From the figure it can be seen that the g_1 has a very less effect on the return loss at port 1. A slight change in the first resonance frequency can also be noticed. Fig. 10 (b) shows the effect of g_1 on the return loss at port 2. From the figure it can be seen that g_1 has significant effect on return loss at port 2 especially at the higher frequencies. Fig. 10 (c) shows the effect of g_1 on the return loss at port 3. From the figure it can be seen that, there is a negligible effect on return loss at port 3 due to variation of g_1. Fig. 10 (d) shows the effect of g_1 variation on the (S_{21}) isolation between port 1 and port 2. From the figure it can be seen that there is significant effect on S_{21} especially at the higher frequencies. Moreover, as the value of g_1 decreases the isolation between the ports increases at the higher frequencies. Fig. 10 (e) shows the effect of g_1 variation on the isolation between port 1 and port 3. From the figure it can be seen that, with the increase in the value of g_1 the isolation at mid frequencies deteriorates. Fig 10 (f) shows the effect of variation of g_1 on isolation between the port 2 and port 3. From the figure it can be seen that, with increase in the value of g_1 the isolation between the ports increases. Finally the value of g_1 is optimized keeping in the view the return losses at different ports and the isolations between the different ports. The optimized value of g_1 is found as 1.5 mm.

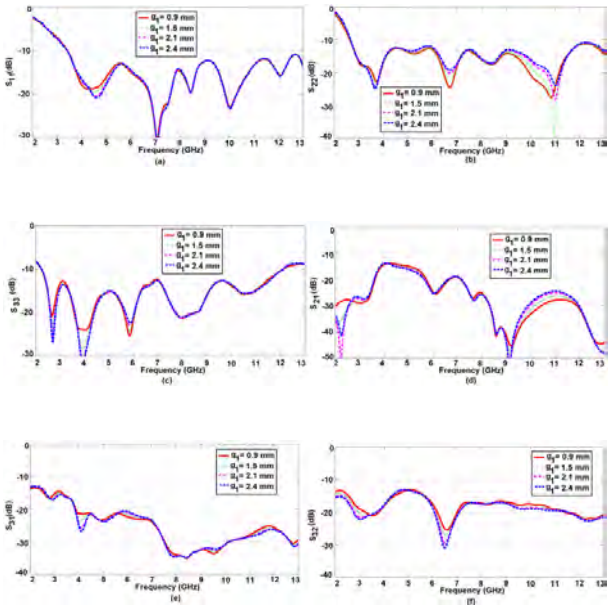


Fig. 10. Effect of g1 variation on (a) S11 (b) S22 (c) S33 (d) S21 (e) S31 (f) S32

Fig.11 (a), (b) and (c) show the effect of g_2 on the return losses of port 1, port 2 and port 3 respectively. From the figures it can be seen that, g_2 has a very less effect on S_{11} and S_{22} while it has a significant effect on S_{33}, such that with increase in the value of g_2 the return loss at the lower frequencies increases and at the higher frequencies decreases. Fig.11 (d) shows the effect of g_2 variation on the isolation between port 1 and port 2. From the figure it can be seen that, it has a very less effect on isolation. Fig. 11(e) shows the effect of g_2 variation on isolation between port 1 and port 3. From the figure it can be seen that, with increase in the value of g_2 the isolation deteriorates at the lower frequencies while improves at the lower frequencies. Fig. 11(f) shows the effect of g_2 variation on isolation between port 2 and port 3. From the figure it can be seen that, g_2 variations has affected the mid frequencies only. Finally, the value of g_2 is optimized for better return losses at the ports and improved isolation between them. The optimized value of the g_2 is found to be 2.2 mm.

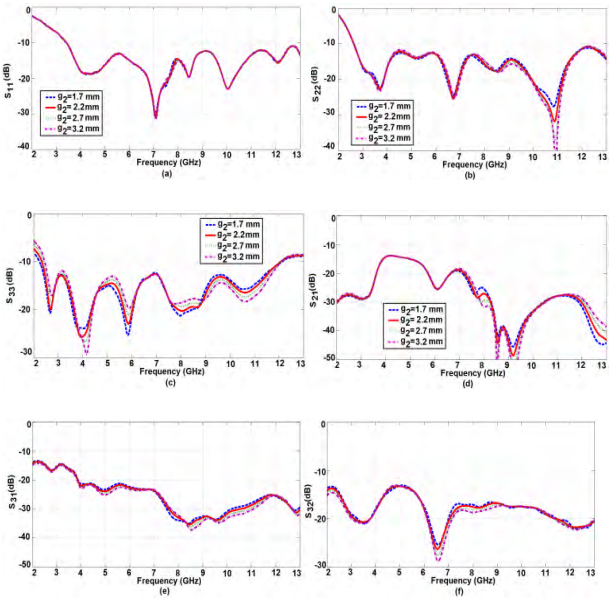


Fig. 11. Effect of g2 variation on (a) S11 (b) S22 (c) S33 (d) S21 (e) S31 (f) S32

VI. Conclusions

A three port compact antenna is designed for MIMO-diversity applications. The antenna operates in UWB region having operational bandwidth from 3 GHz to 13 GHz.The isolation between the different ports are 15 dB or better in the operating band. Out of three, two antenna are placed in the same plane while third is place orthogonal to the other two to achieve polarization diversity. The ECCs for the different ports are less than 0.002 and the diversity gains are greater than 9.98 dB in the operating band. Therefore, this antenna can have applications in different UWB diversity system.

ACKNOWLEDGEMENT

The authors are thankful to Director ARDE, Pune for supporting and encouraging to carry out this technical research work.

REFERENCES

[1] Federal Communications Commission (FCC), First Order and Report: Revision of Part 15 of the Commission's Rules Regarding UWB Transmission, Systems," FCC 02-48, Apr. 22, 2002.

[2] J. Wallace, M. Jensen, A. Swindlehurst, and B. Jeffs, "Experimental characterization of the MIMO wireless channel: Data acquisition and analysis," IEEE Trans. Wireless Commun., vol. 2, no. 2, pp. 335–343, Mar. 2003.

[3] S. Hong, K. Chung, J. Lee, S. Jung, S. S. Lee, and J. Choi, "Design of a diversity antenna with stubs for UWB applications," Microwave. Optical Technology Letter, vol. 50, no. 5, pp. 1352–1356, 2008.

[4] Ling Xiong; Peng Gao, "Compact dual-polarized slot UWB antenna with CPW-fed structure," IEEE International Symposium (APSURSI) on Antennas and Propagation Society, vol., no., pp.1-2, 8-14 July 2012.

[5] B. P. Chacko, G. Augustin and T.A. Denidni, "Uniplanar UWB antenna for diversity applications," Antennas and Propagation Society International Symposium (APSURSI), 2012 IEEE , vol., no., pp.1-2, 8-14 July 2012.

[6] Zhang, Shuai, et al. "Ultrawideband MIMO/diversity antennas with a tree-like structure to enhance wideband isolation." IEEE Antennas and Wireless Propagation Letters, vol. 8, pp. 1279-1282, 2009.

[7] Peng Gao, Shuang He, Xubo Wei, Ziqiang Xu, Ning Wang, and Yi Zheng, "Compact Printed UWB Diversity Slot Antenna With 5.5-GHz Band-Notched Characteristics," IEEE Antennas and Wireless Propagation Letters , vol.13, pp.376-379, 2014.

[8] M.Gallo, E.Daviu, M. Bataller, M. Bozzetti, J. Pardo and L. Llacer, "A Broadband Pattern Diversity Annular Slot Antenna", IEEE Transactions on Antennas and Propagation, Vol. 60, No. 3, 1596-1600, March 2012.

[9] E. Antonino-Daviu, M. Gallo, B. Bernardo-Clemente, M. Ferrando-Bataller, "Ultra-wideband slot ring antenna for diversity applications," Electronics Letters , vol.46, no.7, pp.478-480, April 1 2010.

[10] A. Najam, Y. Duroc, and S. Tedjni, "UWB-MIMO antenna with novel stub structure," Progress In Electromagnetics Research C, Vol. 19, 245-257, 2011.

[11] Fang Xiao Sheng, Kwok Wa Leung, Kwai Man Luk, "Theory and Experiment of Three-Port Polarization-Diversity Cylindrical Dielectric Resonator Antenna," IEEE Antennas and Propagation Transactions, vol.62, no.10, pp.4945-4951, Oct. 2014.

[12] Chi-Yuk Chiu, Jie-Bang Yan, R.D. Murch,"Compact Three-Port Orthogonally Polarized MIMO Antennas," IEEE Antennas and Wireless Propagation Letters , vol.6, no., pp.619-622, Dec. 2007.

[13] Raj Kumar, Rajas K. and R.V.S. Ram Krishna, "A Horizontally Polarized Rectangular Stepped Slot Antenna for Ultra Wide Bandwidth with Boresight Radiation Patterns," IEEE Transactions on Antennas and Propagation, Vol.62, No.7, pp.203-209, 2014.

[14] C. Votis, G. Tatsis, P. Kostarakis," Envelope Correlation Parameter Measurements in a MIMO Antenna Array Configuration," Int'l J. of Communications, Network and system Sciences, Vol.3, no. 4, pp.350 354,2010.

.

This page is kept blank intentionally

Wireless Power Transmission via Solar

Riddhi Vora
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
riddhivora23@gmail.com

Sathvik Shetty
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
sathvikshetty0201@gmail.com

Chirantan Sinha
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
sinhachirantan@gmail.com

Mrs. Kalawati Patil,
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
kalawati.patil@thakureducation.org

***Abstract* — Everyone in today's fast-paced society is in constant need of portable technology. Power is the customers' most frequent concern; where and how do all of our appliances get charged. Wireless charging provides for tension relief and slowing down and plugging in answer. The ability to have electricity without being bound to all our gadgets by cables and, theoretically, without even thinking about it. It is a unique type of charging method in which there is no need for communication. Smartphones or handheld devices can be wireless within a limited range of step away. In the form of an inductive coupling, this concept involves the design and implementation of a versatile charging system that combines solar charging and wireless power transmission (WPT). This technique uses non-conventional power source (solar cell) techniques for the wireless charging of the device. In particular due to a wireless charger, the life span of a mobile charger increases compared to a standard charger. The method proposed is environmentally friendly, Comfortable and user friendly. It can be use as the receiver Pad to make all mobile wireless devices compatible. The system is capable of charging any smartphone, anywhere at any time.**

Keywords—Solar Power, Wireless Power Transmission (WPT), Mobile Charger, Transmitting Coil, Receiving Coil

I. INTRODUCTION

In this Project, we have presented idea of transmitting power from solar which get converted into DC power and to charge mobile phone. Nowadays electrical power generation and transmission become very challenging due to high demand. To overcome this renewable energy sources and the conventional energy transmission should be redesigned to get higher energy utilization. This paper describes about wireless power transfer system using magnetic coupling. Coil which is used in the project is Toroidal coil. With the abundant solar energy in our country, it is essential to extract the maximum solar power at higher efficiency. The innovation of wireless power transfer developed from the inconvenience of having too many wires connected in small power sockets. We thought that many of us have the same experience of having not enough sockets for our electronic devices. The objective of this project is to design and construct a method to transmit wireless electric power and charge designated low power devices. The system will work by using Toroidal coils to transmit power from an AC line to a resistive load. In this project at the receiving part, we are going to charge the mobile phone by converting DC to AC. Every WPT technology has its own advantages and disadvantages. The main research themes of all WPT technologies focus on improving the transmission efficiency and distance. Here, there is one transmitting circuit and one receiving circuit. Both circuits consist of coils, with the help of the coils both circuits can come in contact and could help to transfer power generated from transmitted circuit to receiving circuit. In the project, coil used is TOROIDAL coils. Solar panel will give voltage up to 12V but in the project all circuits are working in 5V. A 40 pin microcontroller named PIC16F877A having 8-bit ROM is used at both transmitting as well as receiving circuit.

II. LITERATURE REVIEW

The solar energy which is a renewable form of energy and is available in abundance can be put to maximum use provided the techniques for harnessing it are appropriate and environment-friendly. WiTricity on the other hand does provide us with a wireless solution, however, is not widely implemented owing to the concerns of the lack of efficiency. In this paper we have reviewed wireless power transfer (WPT) using renewable source i.e., solar energy. The principle behind WPT is inductive coupling wherein an electric field is generated thus transmitting power from transmitter to receiver. Wireless power transmission concept is applied behind WPT. This differs from wired transmission as the medium is costly and requires space because of wires. This paper makes use of components like a solar panel, rechargeable battery, booster circuitry, and load. The concept of wireless power transmission offers greater possibilities for transmitting power with negligible losses. In the long run, this could reduce our society's dependence on batteries, which are currently heavy and expensive. [1]

The solar energy which is a renewable form of energy and is available in abundance can be put to maximum use provided the techniques for harnessing it are appropriate and environment-friendly. WiTricity on the other hand does provide us with a wireless solution, however, is not widely implemented owing to the concerns of the lack of efficiency. One of the major constraints for implementing both the
technologies together hand-in-hand is efficiency. This paper aims to bridge that gap. This paper has mainly focused on combining both the technologies together. Overcoming these shortcomings, the concept explained

in this paper can be applied in various applications. This paper mainly focused on combining both wireless and solar technologies together. This principle of wireless electricity transfer works on the principle of using coupled resonant objects for the transferring electricity. If the efficiency of transmitting the power wirelessly is increased slightly further, then wireless power transmission could become a standard means for charging any electronic gadget, and also if it is by means of a renewable and clean power source such as solar energy, it would be a cherry on top of the cake. The overall goal of this paper is to design and implement a clean power generation and wireless power transmission system. The concept of wireless power transmission through renewable power generation is presented. Mainly focused on providing clean and efficient power transmission through wireless medium, this would offer a major advancement in the field of solar and wireless technology. [2]

To charge mobile phones and cameras (digital as well as CC cameras). MP3, CD and MD players can be charged. This device can also be used to charge batteries of portable DVD, smart card readers, etc. To charge laptops, I-pods, tablets, blue-tooth devices etc. To power 2W bulbs in hut, bed-lamps, low-watt lights, etc. This paper demonstrated a step by step process in designing a solar powered charging backpack that is capable of charging a mobile phone efficiently. A selection of existing products available on the market were reviewed and compared to ascertain the cost, size, and output capabilities. Next, the solar cell types and regulators were compared and their respective merits were also investigated. The charging system was then designed and tested before being integrated with the backpack. The results clearly showed that the system managed to charge the mobile phone. However, it was found that the excessive power dissipation has caused the linear regulator to generate significant heat. Solar acts as good power supplies in bright sunlight.[3][6]

The photovoltaic (PV) market worldwide is booming. In general, 'building attached photovoltaics' is applied, i.e., the solar panels are added to an already finished building. Building integrated photovoltaics (BIPV) differs from this approach: in contrast to building attached photovoltaics, the solar panels of BIPV are an integral part of the building component itself. Building-integrated photovoltaics is steadily entering the market. It allows for solar cells to be an integrated part of the building itself, contrary to installing the photovoltaic modules onto the finished building. Unfortunately, several challenges such as the creation of thermal bridges and moisture intrusion hinder the rapid development of building-integrated photovoltaics into a mainstream mass product. Wireless power transfer systems could solve some of these challenges and contribute to an accelerated use of building-integrated photovoltaic solar cells. In this work, the advantages of wireless power transfer to building-integrated photovoltaics are presented. The different issues and technological challenges are highlighted, and possible solutions are proposed. [4]

This paper reports the study on a topical mode of energy transmission using resonant technique, commonly known as WiTricity (short form of wireless electricity) Detailed theoretical and numerical analyses reveal that WiTricity is efficient and practical for mid-range wireless energy exchange. Unlike conventional inductive coupling methods, there are only very small energy dissipators in off-resonant objects for systems working on WiTricity principle. A non-radiative energy transfer, commonly referred as WiTricity and based on 'strong coupling' between two coils which are separated physically by medium-range distances, is proposed to realize efficient wireless energy transfer. The technology in turn expels E-waste and will free us from the power cords. WiTricity depends upon strong coupled resonance between transmitter and receiver coils. The transmitter emits a non-radiative magnetic field resonating at MHz frequencies and the receiving unit load resonates in that field. Thin film WiTricity cells, consisting of a tape coil on one layer, which is separated by an insulation layer to conductive strips on another layer, are fabricated. These cells are light, compact, and flexible providing convenience and flexibility in the design of wireless devices.[5].

III. GAP IDENTIFICATION

By using electricity, the handset is typically charged these days, generated and supplied from various power stations. But to charge a phone, this proposed device does not need any connection to this form of traditional power source. The handset will be charged by solar energy. So, to charge a phone's battery, additional electricity is no longer needed. Moreover, for charging, this wireless system does not need any wire to connect to the device. The handset just needs to fall on the charging dock and things start to work without anything needing to be plugged into the phone. This is considerably simpler than the conventional wired charging technique. Therefore, it is no longer appropriate to plug and unplug a cable to charge a phone at all times.

IV. PROPOSED METHODOLOGY

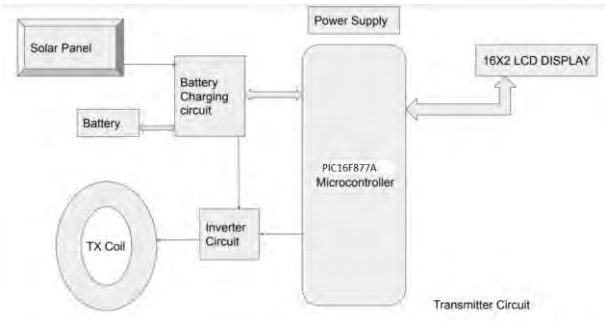


Fig.1. Block Diagram of transmitting circuit.

In Fig1,Solar panel is placed at the start of the diagram. Solar panel will receive DC current . A rectifier diode 1N4007 is placed at Power supply which will convert the DC to AC .A Battery charging circuit is placed next to solar panel inorder to manage battery to be supplied.

A 40 pin PIC16F877A micocontroller is used here. The 40-pin IC has 14 Channel 10-bit ADC making it suitable for applications which require more ADC inputs. The IC also has 2 Comparators, 2 Timers (8-bit and 16-bit) and supports SPI, I2C and UART communication protocols. In this project, circuits are working in 5V. We also placed 16*2 LCD display to check the transmission of power. There is an Inverting circuit which uses TIP122 Power transistor. Two coils are present, one at transmitting circuit and another at receiving circuit. These are inducting coils, to transfer power from transmitting circuit to receiving circuit they need to come in contact. Hence, one coil is placed at the end of transmitting circuit and another is placed at receiving circuit.

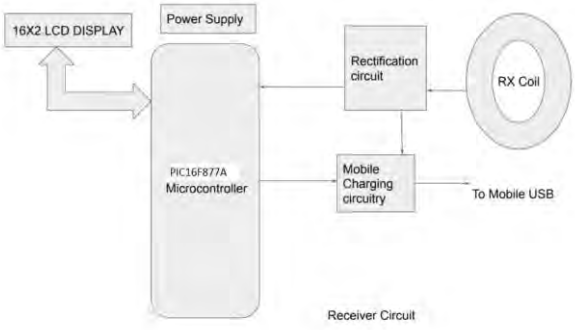


Fig.2. Block Diagram of receiving circuit.

In Fig2, RX coil will receive AC current and will pass the current to Rectification circuit where the current would get rectified and get converted from AC to DC. The current is then passed to 40 pin PIC16F877A microcontroller. Then current is passed to Mobile Charging circuit where it would regulate the current and voltage supplied to mobile for charging. And then it is passed to Mobile USB from where mobile gets charged.

Transmitting circuit:

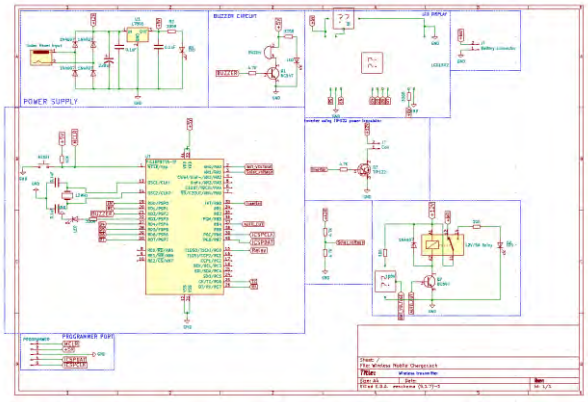


Fig.3. Circuit Diagram of transmitting circuit

Solar Setup for Power Supply:

Fig.4. Solar pannel.

During the hardware implementation portion, a storage device is required to store the produced energy by photovoltaic cells. A battery is a common storage device which is used to store electrical energy produced by photovoltaic cells. To charge a battery by using a solar PV, a charge controller is an important device. Therefore, it will be necessary to connect a charge controller in series between the solar panels and the battery.

PIC16F77A microcontroller:

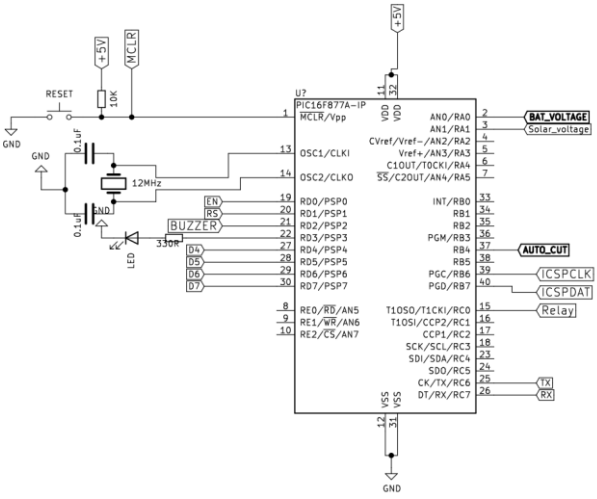


Fig.5. PIC16F77A microcontroller

One of the most renowned microcontrollers in the industry is thePIC16f877a microcontroller. This microcontroller is very convenient to use, and it is also easier to encode or programmed this controller. One of the main advantages is that FLASH memory technology can be used to write-erase as many times as possible. It has a total of 40 pins and 33 input and output pins are available. In many microcontroller projects, PIC16F877A is used. In digital electronics circuits,

PIC16F877A also has a lot of applications. We use a 12MHz crystal oscillator here. We use tags such as buzzers, battery voltage, etc. in the circuit to prevent the mess of connecting wires.

Battery charging Relay:

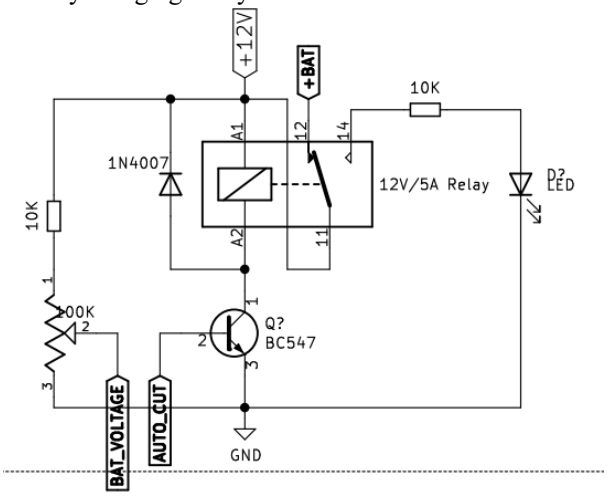


Fig.6. Battery charging circuit.

There is a relay of 12V,5Amp in Fig5. The 12V signal is ultimately connecting through a common pin of a relay to a battery i.e., tag of battery and 12V is directly going to battery and the same 12V is also connecting to 10k resistor and 100k potentiometer arrangement. The middle pin, is used as voltage divider just like we used it for measuring solar voltage and also this pin we measure battery voltage. The battery voltage is connected to pin no2 of PIC16F877A microcontroller i.e., analog 0. This way we can continuously measure the voltage of the battery. Here, the 12Vs plus the voltage of battery is measured because 12V and battery are ultimately connected together in relay pin. When the relay is off, the pin will be connected to battery. Similarly, when relay is on, the pin losses its connection with battery. There is a LED placed with 10k resistor which indicates the amount of battery collected by solar. The main job of battery is, it gets glow when the battery is fully charged.

Receiving Circuit:

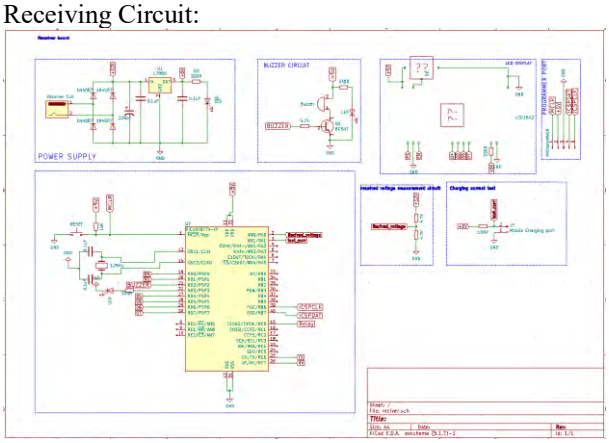


Fig.7. Circuit Diagram of receiving circuit.

In Fig.6, Power supply, Buzzer and PIC16F87A microcontroller is same as transmitting circuit. Only the received voltage measure circuit and the charging current test circuit are added here instead of inverter, voltage divider and battery charging. The current will pass from coil at the transmitting circuit to the coil of eceiving circuit. The coils should be Resonant inductive coupling. The resonating frequency between both coils must be same. Power can be transferred only if both coils have match frequency.

Received voltage measure circuit:

Receiver voltage circuit measures the amount of voltage coming after transformation at receiving part. It is similar to voltage divider circuit in transmitting part. The 12Vs mentioned here is the voltage we are getting at receiving coil. It will measure the voltage which is received after rectification. The tag received voltage is attached to the microcontroller AN0 i.e., pin no 2.

These are 2 features added at receiving circuit, rest part is same as transmitting circuit.

V. RESULT

After completing the table assembly, A running suite of tests to ensure the design objectives and requirements are met. The test is separated into two major parts, the output capacity of the solar cells and the battery charge rate, and the power transmitted through the coils and the final output power reaching the charging unit. The expected power transmission is of 5V from transmitter coil to receiver coil. Also, it is expected that Mobile should get charged with minimum power loss.

Bellow the Table 1 shows the result of different distances with the voltage varied when the distance is different. The DC input source was used and the LED used as a Load. Figure 9 shows the graph that has been created. The DC output voltage and frequency getting lower as the distance are higher. From this graph we can conclude that the wireless power transmission is higher when the distance is nearer.

Distance (cm)	Solar Source Volt	DC output Voltage (Volt)	Frequency (MHz)	Efficiency %
0	9	8.89	3.34	98.78
1	9	8.36	3.20	92.89
2	9	8.01	3.13	89.00
3	9	7.86	3.05	87.33
4	9	6.93	2.90	77.00
5	9	6.01	2.82	66.78
6	9	5.79	2.73	64.33
7	9	4.88	2.61	54.22
8	9	4.16	2.53	46.22
9	9	3.88	2.41	43.11
10	9	3.60	2.30	40.00

Table1: The difference data vs Solar DC output voltage and Frequency

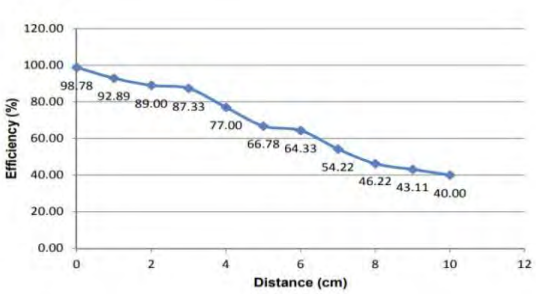


Fig.8. Graph of wireless power transfer efficiency and varied distance

VI. CONCLUSION

The concept of wireless power transmission through renewable power generation is presented. Mainly focused on providing clean and efficient power transmission through wireless medium, this would offer a major advancement in the field of solar and wireless technology. And successfully charged the mobile phone via solar power. The main Aim was to transfer power wirelessly which is successful achieved. Wireless technology is something that should be used in order to avoid mess of wire in circuits. For several portable devices, such as cell phones and other wireless applications, this wireless charging system is suitable. This research is focused on solar Wireless Infrastructure and Electricity. So electronic devices can be easily charged without any wire and battery during load shedding and travelling. Actually, this device is very powerful and reliable.

Future Scope:

The portable solar charger is essentially designed to charge the mobile battery. With the advent of wireless extended distance charging, it is possible to charge the equipment by walking on the street outside. Similar to a Wi-Fi hotspot, it will function like a hotspot location, the system gets charged as users walk or talk.

Wireless charging now will allow the vehicles to power up. There will be no connectors or charging cables used by this wireless charging vehicle. Drivers use a wireless energy source to park their electric vehicles. The device then automatically transfers power to the vehicle's battery charger. For wireless charging vehicles, these high-rate electrochemical batteries can be used. So, vehicles can be paid within very short periods of time.

REFERENCES

[1] S. Pawade, T. Nimje, and D. Diwase, “Goodbye wires: Approach to wireless power transmission”, Int. J. Emerging Technol. and Adv. Eng., vol. 2, issue 4, pp. 382-387, Apr. 2012.

[2] L. Xie, Y. Shi, Y. Hou, and H. Sherali, "Making sensor networks immortal: An energy-renewal approach with wireless power transfer", IEEE/ACM Trans. on Networking, vol. 20, no. 6, pp. 1748-1761, 2012. Available: 10.1109/tnet.2012.2185831.

[3] L. Xie, Y. Shi, Y. Hou, W. Lou, and H. Sherali, "On traveling path and related problems for a mobile station in a rechargeable sensor network", Proceedings of the fourteenth ACM international symposium on Mobile ad hoc networking and computing - MobiHoc '13, 2013. Available: 10.1145/2491288.2491291.

[4] S. Shilpa, H. M. Manasa, S. S. Mariam, and M. K. Kumar M, “Wireless battery charger”, Int. J. Eng. Trends and Technol., vol. 35, no. 3, pp. 125-128, May 2016.

[5] Global Market Revenue for Wireless Charging to Rise by Nearly Factor of 40 by 2018,.IHS, March 13, 2014.

[6] Wireless power for mobile devices market to reach $5 billion by 2020, Information Age, 16 November 2014.

This page is kept blank intentionally

A Four Port UWB Antenna for Diversity Applications

Raj Kumar
Armament Electronics (Microwave Antenna or RF Division, NFM Building, ARDE, Homi Bhabha Road Pashan,
Pune- 411021,
dr.rajkumarkumar@yahoo.com

Pramod Dhande
Armament Electronic (Microwave Antenna or RF Division), NFM Building, ARDE, Homi Bhabha Road Pashan,
Pune- 411021

***Abstract*— In this paper, a compact Ultra Wideband (UWB) diversity antenna design is presented. The antenna is a microstrip fed monopole with quarter ring shaped ground plane and an 'ONKAR' shaped radiating patch. Two such antennas are placed orthogonally to obtain a two port diversity antenna which is further modified to a four port diversity antenna by placing two more antennas. U-shaped reflectors are inserted in the ground plane to improve the isolation between the ports. The impedance bandwidth of the two port antenna is from 3.2 GHz to 12 GHz while the impedance bandwidth of the four port antenna is from 3.3 GHz to 12 GHz. The isolation between the ports is 15 dB or better over most of the operating band for both the diversity antennas. The correlation coefficient is less than 0.2, the diversity gain is around 10 dB and the capacity loss is less than 0.3 bits/sec/Hz in the operating band for both the antennas. The radiation patterns in both the planes (E-plane and H-plane) are also presented for different port excitations. The antenna will be useful for ultra wideband diversity applications such as MIMO communication, precision radar and medical imaging.**

Keywords*— *Microstrp Antenna, Ultra wide band Antenna, MIMO and diversity

I. INTRODUCTION

In today's world, UWB communication has got much attention due to its application in radar and high data rate wireless communication. The Federal Communications Commission (FCC) has authorized the unlicensed use of the 3.1–10.6 GHz spectrum for UWB applications [1]. Also, the mobile communication industry is considered as the most developing wireless industry but it has the limitation of low data rate. Multiple Input Multiple Output (MIMO) system gained much of the attention due to its potential of increasing the channel capacity without extra bandwidth or extra power [2]. Antennas for various types of diversity such as pattern diversity, spatial diversity and polarization diversity have been studied and developed in the past [3-7]. Among these, pattern diversity antennas are very useful in combating multipath fading problem. Also in the past, many efforts have been made to design compact antenna systems for MIMO application with two ports and four ports [8-15]. In [8], an UWB, MIMO/diversity antenna is designed to operate in 3.1-10.6 GHz band with a size of 35 mm x 40 mm. In [9], a 74 mm x 48 mm MIMO/diversity antenna is designed for UWB applications. An H-shaped structure is added in the ground plane to improve the isolation. A 60 mm x 60 mm four port antenna is proposed in [10] for diversity application.

The isolation between the ports is better than 15 dB. This antenna operates in UWB region with three notches. A four port differential fed antenna is designed to operate in UWB with two notches in [11]. The size of antenna is 65 mm x 65 mm. In [12] four PIFA antennas are placed at the four corners of a substrate of size 100 x 60 x 0.8 mm3. The antenna is designed for a tri band operation for LTE, Bluetooth and WiMAX applications and has isolation better than 12 dB over the band. Four microstrip fed monopoles are arranged to form a diversity antenna in [13]. By placing rectangular slits in the ground plane isolation of 15 dB is achieved. The size of the antenna is 52 x 40 mm2. In the four port antenna proposed in [14], four microstrip fed monopoles share a common radiating element and a ring shaped ground plane. The antenna has a size of 120 mm x 140 mm, an impedance bandwidth from 1.8 – 2.9 GHz and an isolation of 15 dB over the band. A 4 port antenna of size 40 x 40 mm2 is proposed in [15]. The antenna consists of two printed F antennas and two quarter wave slot antennas. The antenna operates from 2.41 GHz to 2.54 GHz with isolation better than 12 dB over the band. A comparison of the size and performance of the above discussed antennas is made in Table 1. It can be seen that the above discussed antennas can be seen to have a larger size. Therefore there is a need for compact UWB antennas for diversity applications.

Table I. Comparison of the diversity antennas

Ref	Ports	Antenna Size (mm x mm)	Impedance Bandwidth	Isolation better than
8	Two	35 x 40	3.1 – 10.6 GHz	16 dB
9	Two	74 x 48	2.5 – 12 GHz	10 dB
10	Four	60 x 60	3.0 – 11.0 GHz	15 dB
11	Four	65 x 65	2.0 – 11.0 GHz	40 dB
12	Four	100 x 60	1.56 – 1.58 GHz, 2.4 – 2.7 GHz 3.3 – 3.4 GHz, 5.1 – 5.4 GHz	12 dB
13	Four	52 x 40	3.0 – 12.0 GHz	15 dB
14	Four	120 x 140	1.8 – 2.9 GHz	15 dB
15	Four	40 x 40	2.41 – 2.54 GHz	12 dB
Proposed	Four	34 x 36	3.2 – 12.0 GHz	15 dB

In this paper, a compact UWB monopole antenna is designed, and then this antenna is utilized to design the two port and four port structures. The isolation between the ports is 15 dB or better in the operating band. A U-shaped structure in the ground plane is used as reflector to improve the isolation between the ports. The UWB antenna has an impedance bandwidth from 3.2 GHz to 12 GHz and beyond. The diversity antenna is a potential candidate for UWB applications with increased channel capacity.

II. ANTENNA DESIGN

The schematic of the proposed UWB antenna is shown in Fig. 1. The antenna is designed on a FR-4 substrate. The thickness of the substrate is 1.6 mm, the dielectric constant is 4.4 and the loss tangent is 0.02. The antenna is a monopole which is fed by a 50 Ω microstrip line of width W2. The radiating patch is ONKAR shaped. The ground plane is having quarter ring shape for good impedance matching. A rectangular slot L3 is etched out from the quarter ring shaped ground structure to improve the impedance matching at middle frequencies. Fig. 2 shows the return loss characteristics of the antenna with and without the L3 slot. From the figure, it is evident that cutting the slot improves the return loss characteristics from 6 GHz to 8 GHz. The width of the ring controls the impedance matching throughout the operating band. Fig. 3 shows the effect of width on the return loss characteristics of the antenna. From the figure, it can be seen that with an increase in the width of ring, the return loss at the lower frequencies improves but deteriorates at higher frequencies. Therefore, there is a need of optimizing the width for maximum impedance bandwidth. The width W4 is optimized and found to be 4.2 mm. The optimized parameters for the UWB antenna are given in Table 1.

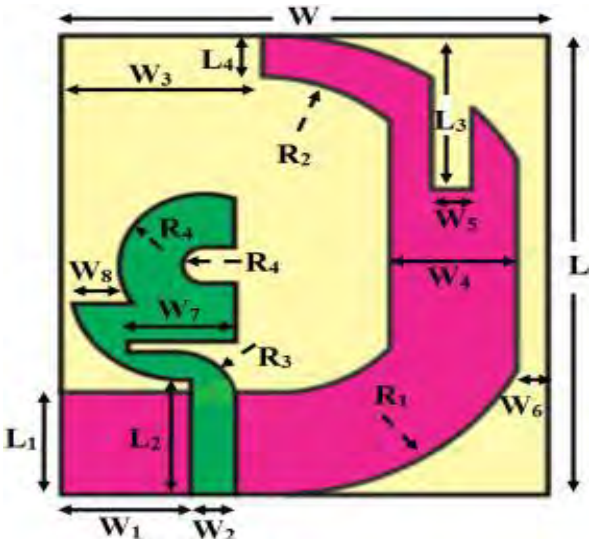


Fig.1. Data flow diagram

Table. 1. Optimized dimensions of the proposed UWB (in mm)

Para-meter	L	L_1	L_2	L_3	L_4	L_5	L_6	L_7	W	W_1	W_2
Value (mm)	18	4.03	4.5	6	1.6	9	2.5	7.5	16	4.25	1.5
Para-meter	W_3	W_4	W_5	W_6	W_7	W_8	W_9	W_a	W_b	L_b	
Value (mm)	6.6	4.2	1.3	1	3.55	2	2.3	34	34	36	

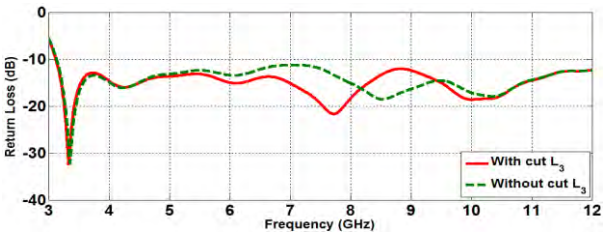


Fig.2. Effect of cutting slot L3 in the ground plane on the return loss of the proposed antenna

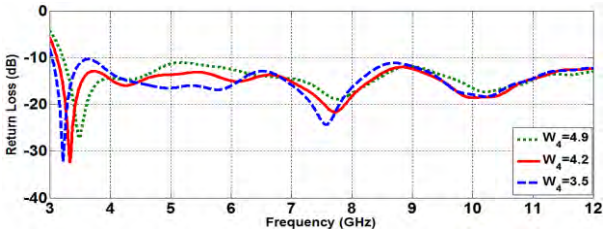


Fig.3. Effect of width W4 of ring shaped ground structure on return loss characteristics of the proposed antenna

The antenna is utilized to generate a two port diversity antenna. Fig. 4 shows the geometry of the two port antenna system. A U-shaped structure is added to the ground plane. This structure acts as a reflector for waves radiated by different antenna elements and thereby it increases the isolation between the ports. The two antenna elements are placed orthogonally to each other to obtain polarization diversity. Again the same UWB antenna structure is utilized to create a 4 port diversity antenna and it is shown in Fig. 5. Similar to the previous case, U shaped structures are placed in the ground plane to increase the isolation between different ports of the antenna system. In this case, two U shaped structures are used. The antenna dimensions are optimized for optimum impedance bandwidth with high isolation between the ports. The optimized dimensions are given in Table 1.

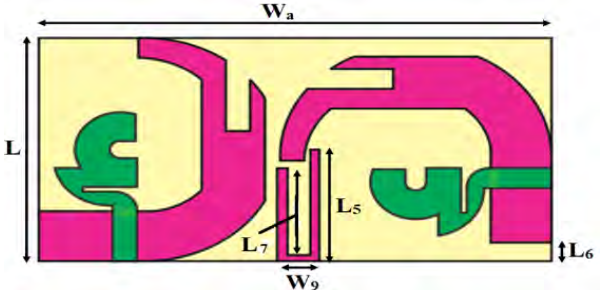


Fig.4. Geometry of the two port antenna system

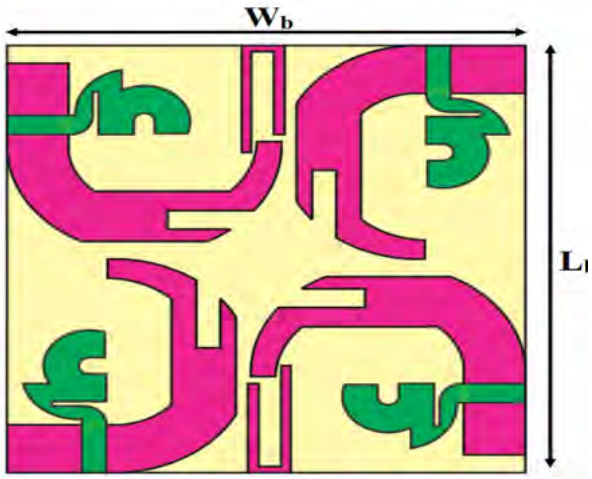


Fig.5. Four antenna system geometry

III. RESULT AND DISCUSSION

A. UWB Antenna

The antenna is simulated and optimized on CST Microwave studio. The reflection coefficient of the antenna is plotted against frequency and shown in Fig. 6. From the figure, it can be seen that the antenna shows an UWB operation having impedance bandwidth from 3.2 GHz to 12 GHz and beyond. The simulated radiation patterns at the different frequencies are shown in Fig. 7. From the figure, it can be seen that the radiation patterns are omni-directional in H-plane while bidirectional in E-plane. The peak gain of the antenna is shown in Fig. 8. From the figure, it can be seen that the peak gain is around 4 dB in the operating band.

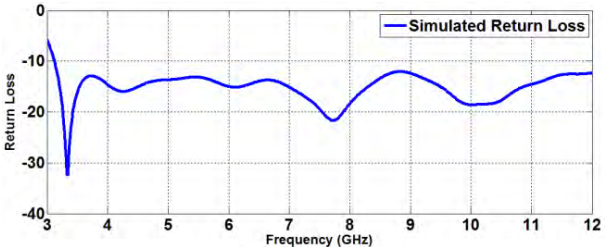


Fig.6. Simulated return loss of the proposed antenna

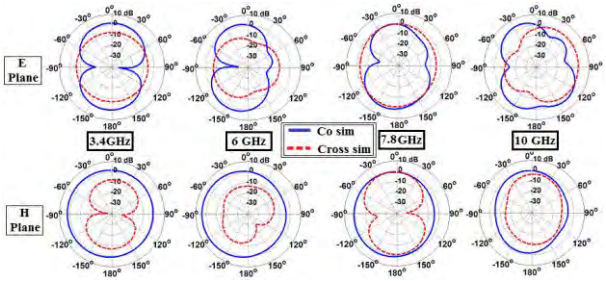


Fig.7. Simulated radiation patterns of the antenna at different frequencies in both the planes (E-Plane and H-Plane)

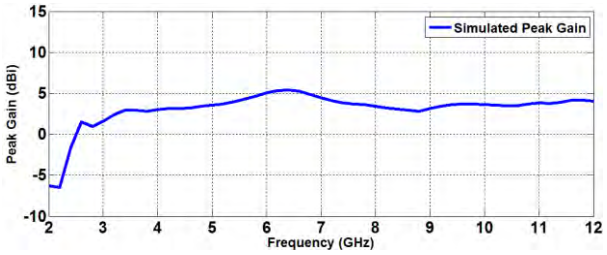


Fig.8. Simulated peak gain of the proposed antenna

B. Two port Antenna System

The above discussed UWB antenna is used to create a two port antenna system. The antennas are placed orthogonally to create pattern diversity. A U-shaped structure is used as reflector to increase the isolation between the ports. Fig. 9 shows the simulated return loss of the proposed two port antenna system. From the figure, it can be seen that the antenna operates in UWB region from 3.2 GHz to 12 GHz and beyond. Fig. 10 shows the isolation between the two ports. From the figure, it can be seen that the isolation between the two ports is 15 dB or better in the operating band except at the lower frequencies. Fig. 11 shows the effect of the reflector on antenna return loss and isolation between the ports. By the introduction of the reflector, the isolation is improved at the higher frequencies.

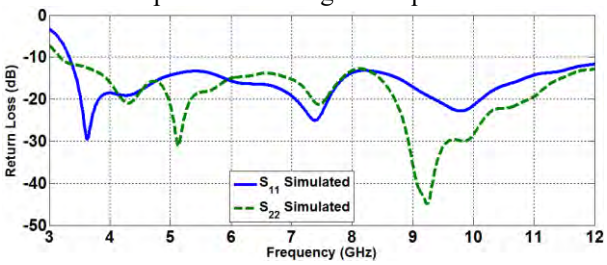


Fig.9. Return loss of the proposed two antenna system

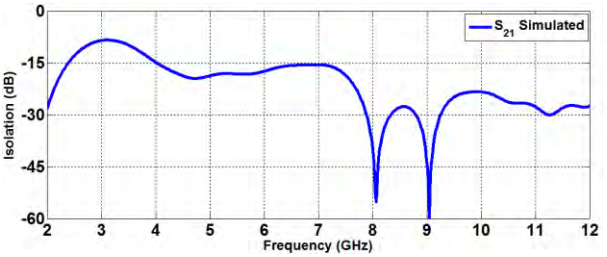
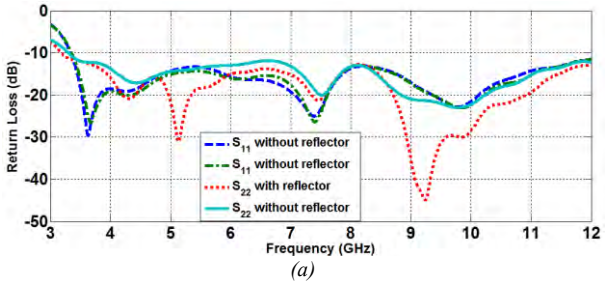
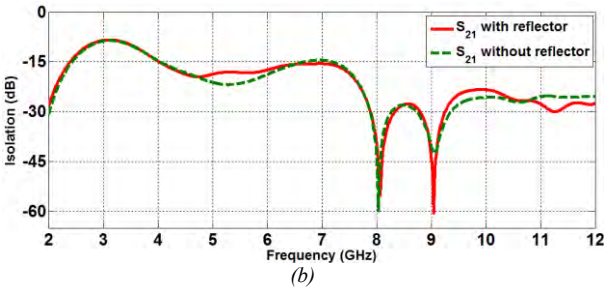


Fig.10. Isolation between the two ports of the proposed two antenna system



(a)



(b)

Fig.11. Effect of introducing reflector in the ground plane of the two antenna system on (a) Return Loss (b) Isolation between the ports

The radiation patterns of the antenna are obtained by simulation for both the ports. Fig. 12 shows the radiation patterns of the antenna in both the planes at different frequencies. The antenna shows pattern diversity in both the planes. The peak gain of the antenna for both the ports is shown in Fig. 13. The peak gain of the antenna is around 4-5 dB in the operating band.

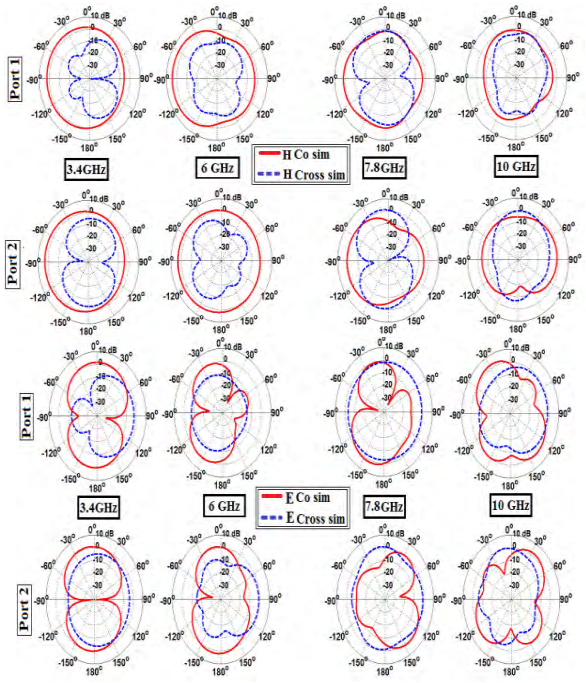


Fig.12. Simulated radiation patterns for both the ports in both the planes

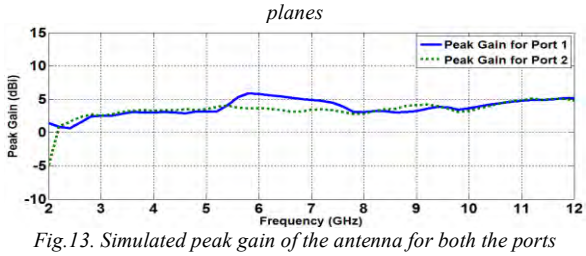


Fig.13. Simulated peak gain of the antenna for both the ports

The diversity performance of an antenna system is evaluated by measuring the diversity gain and the Envelope Correlation Coefficient (ECC) between the two ports. The ECC can be calculated by using equation (1) as mentioned in [16].

$$\rho_e = \frac{\left|S_{11}S_{12} + S_{21}S_{22}\right|^2}{\left(1 - (|S_{11}|^2 + |S_{21}|^2)\right)\left(1 - (|S_{22}|^2 + |S_{12}|^2)\right)} \quad (1)$$

The ECC of the proposed antenna is obtained from the simulated S-parameters of the antenna. The ECC over the operating band is shown in Figure 14 and is lower than 0.002. A comparison of the simulated and measured diversity gains is given in Figure 15. The diversity gain is around 10 dB in the operating band. The capacity loss of the antenna system is shown in Fig. 16. From the figure it can be seen that the capacity loss is less than 0.3 bits/sec/Hz in most of the operating band.

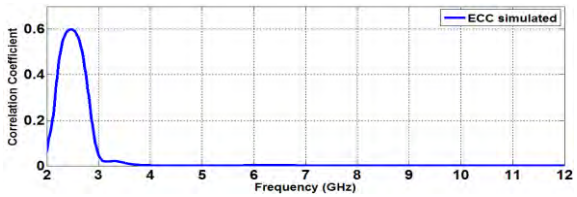


Fig.14. Simulated correlation coefficient of the proposed antenna system

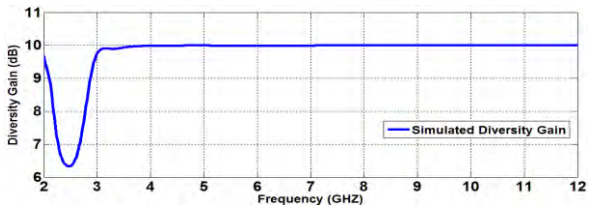


Fig.15. Simulated Diversity gain of the proposed antenna system

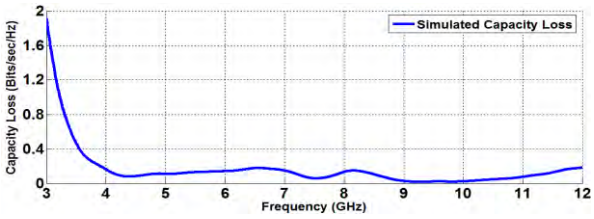


Fig.16. Simulated capacity loss of the proposed antenna system

C. Four port Antenna System

To further increase the channel capacity, four similar antennas are placed orthogonally to each other to create a four port antenna system for pattern diversity. Two U-shaped reflectors are used to improve the antenna characteristics. The simulated return loss of the antenna system is shown in Fig. 17. It can be seen that the antenna has an impedance bandwidth from 3.5 GHz to 12 GHz and beyond. The isolations between the different ports are shown in Fig. 18. It can be noticed that the isolations between the different ports are around 15 dB or better in the operating band. Fig. 19 shows the effect of adding two reflectors in the ground plane on the return loss of the antenna system. From the figure, it can be seen that adding the reflector significantly improves the return loss characteristics especially at port 2.

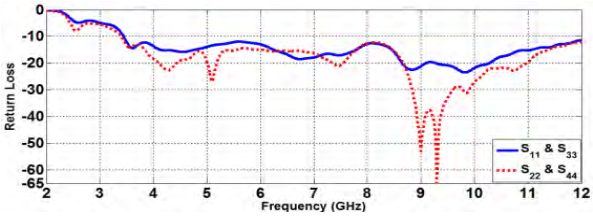


Fig.17. Simulated return loss of the proposed antenna system at different port

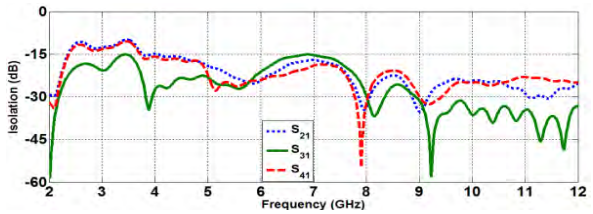
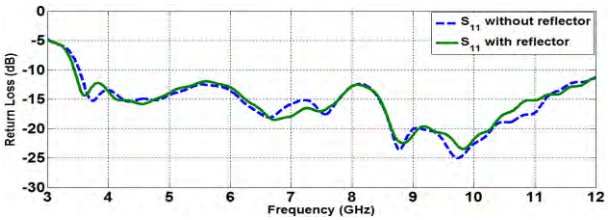
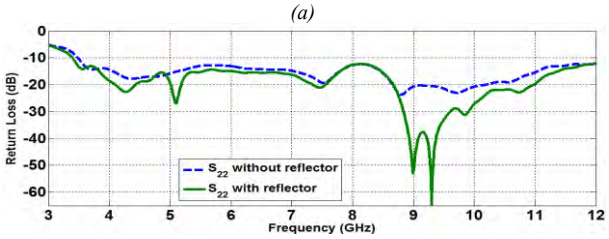


Fig.18. Simulated isolation between the different ports of the proposed antenna system



(a)



(b)

Fig.19. Effect of adding reflector in the ground plane of the proposed antenna on return loss at (a) Port 1(b) Port 2

The surface current distribution at 5 GHz for different port excitations is shown in Fig. 20. It can be seen that for any excitation, maximum current is found on that particular monopole and very less current is observed on the other monopoles. On the other hand, a large current can be seen on the U-shaped reflectors. Thus, by absorbing the current, the reflectors provide the necessary isolation between the ports.

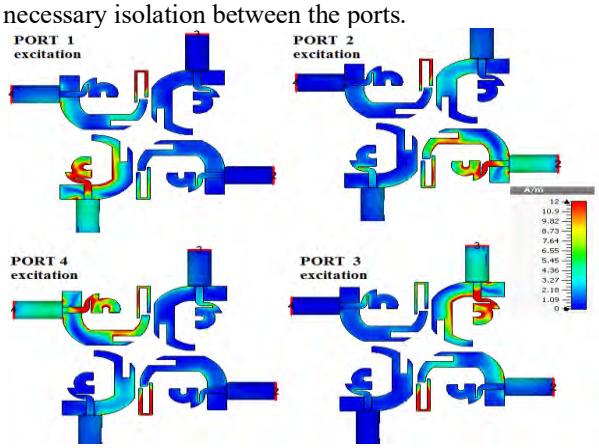
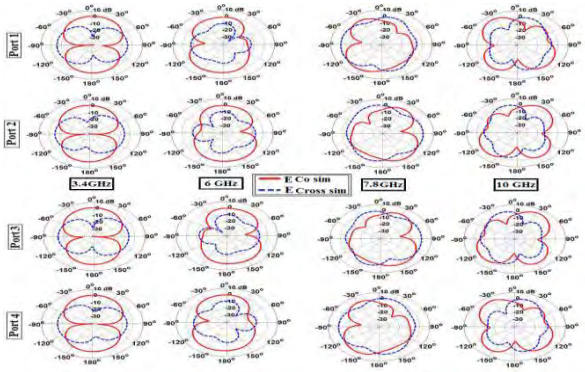
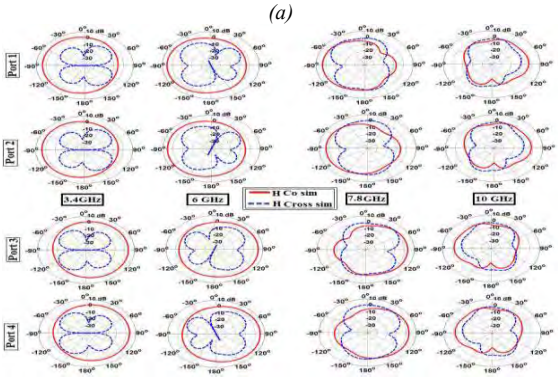


Fig.20. Surface current distribution at 5 GHz for different port excitations

The radiation patterns in both the planes (E-Plane and H-plane) are obtained by simulation and it is shown in Fig. 21 for all the four ports. From the figure, pattern diversity of the four port antenna system is evident as the radiation patterns are orthogonal to each other. The peak gain of the antenna system is obtained for different port excitations and shown in Fig. 22. The average peak gain of the antenna system is around 4 dB for all the four ports. Fig. 23 shows the Envelope Correlation Coefficient (ECC) of the proposed antenna. It can be noticed from the figure that the ECC values are less than 0.002, which is highly desirable for a diversity system. The diversity gain of the antenna is shown in Fig. 24. From the figure it can be seen that the diversity gain of the antenna system is around 10 dB in the operating band. The capacity loss of the system is also calculated and shown in Fig. 25. From the figure it can be noticed that the capacity loss of the antenna system is less than 0.3 bits/sec/Hz.



(a)



(b)

Fig.21. Simulated radiation pattern of the proposed antenna system for different port excitation at different frequencies in (a) E-plane (b) H-plane

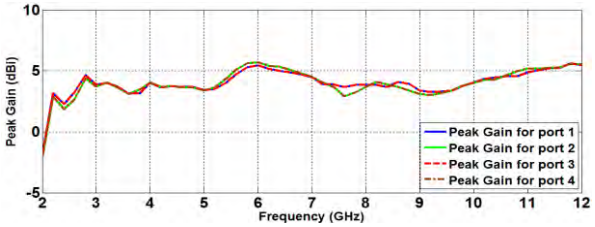


Fig.22. Simulated peak gain of the proposed antenna at different port excitation

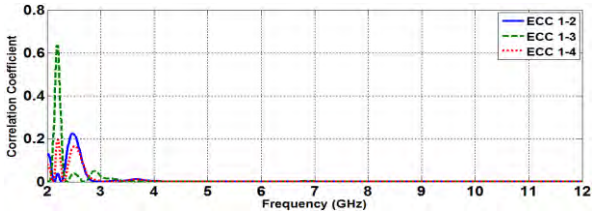


Fig.23. Simulated Correlation coefficient between the ports

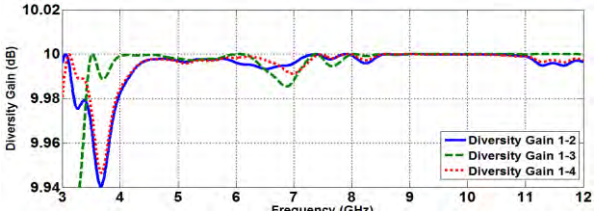


Fig.24. Simulated Diversity gain of the antenna system

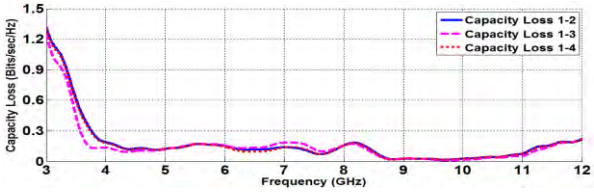


Fig.25. Simulated capacity loss between different ports of the antenna system

IV. CONCLUSION

A compact, UWB monopole antenna is designed. The antenna has an ONKAR shaped radiating patch and a quarter ring shaped ground plane. This antenna design is utilized to create a two port and a four port diversity antenna system. U-shaped slot structure is introduced in the ground plane to improve the isolation between the ports. The final designed four port antenna system has a compact size and isolation better than 15 dB over most of the band. The antenna further has ECC less than 0.002, diversity gain around 10 dB and capacity loss of less than 0.3 bits/sec/Hz in the operating band. Therefore, this antenna is a good candidate for compact diversity system applications with ultra wide bandwidth.

ACKNOWLEDGMENT

The authors are thankful to Director ARDE, Pune for supporting and encouraging to carry out this technical research work.

REFERENCES

[1] FCC, “First report and order,” 2002.

[2] R. G. Vaughan, J.B. Andersen,"Antenna diversity in mobile communications," IEEE Transactions on Vehicular Technology, vol.36, no.4, pp.149-172, Nov. 1987.

[3] M.Gallo, E.Daviu, M. Bataller, M. Bozzetti, J. Pardo and L. Llacer, “A Broadband Pattern Diversity Annular Slot Antenna”, IEEE Transactions on Antennas and Propagation, Vol. 60, No. 3, pp.1596-1600, March 2012.

[4] S.M. Mikki, Y.M.M. Antar, "On Cross Correlation in Antenna Arrays With Applications to Spatial Diversity and MIMO Systems," IEEE Transactions on Antennas and Propagation , vol.63, no.4, pp.1798-1810, April 2015.

[5] Su Daoyi, J.J Qian, Hua Yang, and Fu Demin, "A novel broadband polarization diversity antenna using a cross-pair of folded dipoles," IEEE Antennas and Wireless Propagation Letters, vol.4, pp.433-435, 2005

[6] He Huang, Ying Liu, Shaoshuai Zhang and Shuxi Gong, "Uniplanar Ultra wide band Polarization Diversity Antenna With Dual Band-Notched Characteristics," IEEE Antennas and Wireless Propagation Letters, vol.13, no., pp.1745-1748, 2014

[7] J. S. Kim, Shin Kwang-Ho, Seung-Mo Park, Won-kyu Choi and Nak-Seon Seong, "Polarization and Space Diversity Antenna Using Inverted-F Antennas for RFID Reader Applications," IEEE Antennas and Wireless Propagation Letters, vol.5, no.1, pp.265-268, Dec. 2006

[8] Zhang, Shuai, et al. "Ultra wideband MIMO/diversity antennas with a tree-like structure to enhance wideband isolation." IEEE Antennas and Wireless Propagation Letters, vol. 8, pp. 1279-1282, 2009

[9] N. Gogosh, M. F. Shafique, R. Saleem, I. Usman and A. M. Faiz, "An UWB diversity antenna array with a novel H-type decoupling structure," Microw. Opt. Technol. Lett., 55: 2715–2720, 2013

[10] H. Huang, Y. Liu, S.-S. Zhang and S.. - X. Gong, “Compact polarization diversity ultrawideband mimo antenna with triple band-notched characteristics,” Microw. Opt. Technol. Lett., vol. 57, pp. 946–953, 2015

[11] H. Huang, Y. Liu and S. -X. Gong, “Differential-fed ultrawideband polarization diverstiy antenna with dual notch bands,” Microw. Opt. Technol. Lett.,vol. 57, pp. 1084–1089, 2015

[12] Hari Singh, G K Pandey, P K Bharti, Mayank Agarwal and M K Meshram, “Simulation study of four element MIMO antenna system with pattern and polarization diversity,” International Journal of Advances in Science and Technology, November 2014

[13] V. T. Repe and V. G. Kasabegoudar, “Four ports multiple input multiple output diversity antenna for UWB applications”, International Journal of Computer Applications, Vol. 128, No. 13, pp. 40 – 48, 2015

[14] A. Moradikordalivand, T. A. Rahman and M. Khalily, “Common Elements Wideband MIMO Antenna System for WiFi / LTE Access-Point Applications,” IEEE Antennas and Wireless Propagation Letters,” Vol. 13, pp. 1601 – 1604, 2014

[15] C.-Y.Chiu and R. D. Murch, “Compact Four Port Antenna Suitable for Four Port MIMO devices,” IEEE Antennas and Wireless Propagation Letters, Vol. 7, pp. 142- 145, 2008

[16] S. Blanch, J. Romeu, and I. Corbella, “Exact representation of antenna system diversity performance from input parameter description,” Electron. Lett.," vol. 39, no. 9, pp. 705–707, May 2003

Milk Adulteration Test using Microstrip Patch Antenna

Vishal Kushwaha
Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai,India
Vishalrk94@gmail.com

Suraj Jha
Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai,India
suraj902246@gmail.com

Vikas Kumawat
Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai,India
vikas.kumawat66@gmail.com

Megha Gupta
Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai,India
megha.gupta@thakureducation.org

***Abstract*—The proposed work is aimed to design a microstrip antenna for the detection of adulteration in milk. A microstrip antenna resonating at frequency of 838MHz is designed. An inset feed technique is used for feeding the microstrip antenna. The microstrip antenna is miniaturized and optimized by using miniaturization techniques namely meandering of patch and shorting of the patch with ground plane. The microstrip antenna is used as a sensor rather than for communication purpose. The non-adulterated milk sample which is placed on the radiating patch makes the microstrip antenna sensor to radiate at a specific resonant frequency i.e., at 838MHz. When the non-adulterated milk sample is replaced by adulterated milk sample the resonant frequency of antenna is shifted from 838MHz. The resonant frequency of the microstrip antenna sensor is inversely proportional to the dielectric constant or permittivity of the sample placed on it. Thus, from the resonant frequency of the microstrip antenna it is detected whether the milk sample is adulterated or not.**

Keywords—Microstrip antenna, resonant, frequency, sensor, adulteration, milk sample.

I. INTRODUCTION

The milk adulteration is a serious concern in industries of all the countries. Many adulterants are used for the adulteration of the milk like melamine, urea, whey powder, etc. The adulteration level of the milk must be under control otherwise serious health issues can emerge. The Chinese milk scandal is one of the examples of adulteration in milk where baby food milk laced with melamine made several kids and citizens of the China seriously sick in 2008. Many techniques are used to detect the adulteration in the milk, some commercially available spectroscopic techniques are Near-Infrared Spectroscopy (NIRS) and Laser Induced Breakdown Spectroscopy (LIBS). In this project we proposed to use a microstrip antenna as a sensor to detect the adulteration in milk which is inexpensive as compared to sources and detectors used in above mentioned methods. The detection of adulteration in milk using microstrip antenna is an electrical method as it is based on an electrical property i.e., dielectric constant of the sample. Also, the method is non-invasive, portable, cost effective and easy to use.[5]

Microstrip Patch Antenna in their simplest form consist of a conducting radiating patch on one side of the substrate and a conducting ground plane on the other side. The electromagnetic waves are radiated through radiating patch to which electrical signal is feed. The top view and side view of rectangular microstrip antenna as shown in figure. The top layer is conducting patch and the bottom layer is conducting ground plane.

In middle there is a substrate with permittivity or dielectric constant. The microstrip antenna radiates at a particular resonant frequency and has narrow bandwidth. Due to its size, weight, ease of manufacturing it is used in various fields such as aerospace, defense, telecommunication, etc. Besides communication, recent research shows that the microstrip antennas can also be used as a sensor for detection of temperature, strain, dielectric, etc.

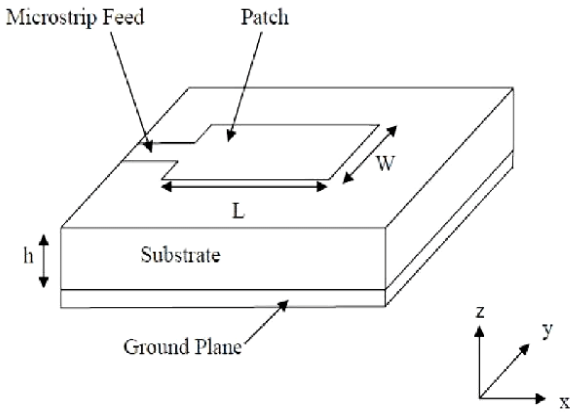


Fig.1: Microstrip Patch Antenna

A.Abbreviations and Acronyms
NIRS- Near Infrared Spectroscopy
HFSS- High Frequency Simulation Software
Eeff - Effective Dielectric Constant
Leff - Effective length
fr - Resonant Frequency
B.Units
•mm – millimeter
•MHz - Megahertz
C.Equations
Calculation of the Width:

$$W = \frac{c}{2f_0\sqrt{\frac{\varepsilon_r+1}{2}}} \qquad \text{------ (1)}$$

Calculation of the Effective Dielectric Constant: This is based on the height, dielectric constant of the dielectric and the calculated width of the patch antenna.

$$\varepsilon_e ff = \frac{\varepsilon_r + 1}{2} + \frac{\varepsilon_r - 1}{2}(1 + 12\frac{h}{W})^{-}\frac{1}{2} \quad \text{------ (2)}$$

Calculation of the Effective length

$$L_e ff = \frac{c}{2f_0\sqrt{\varepsilon_e ff}} \quad \text{------ (3)}$$

Calculation of the length extension L

$$\triangle L = 0.412h\frac{(\varepsilon_e ff + 0.3)(\frac{W}{h} + 0.264)}{(\varepsilon_e ff - 0.258)(\frac{W}{h} + 0.8)} \text{------ (4)}$$

Calculation of actual length of the patch

$$L = L_{eff} - 24L \quad \text{------ (5)}$$

II. LITERATURE SURVEY

Review on Adulteration of Milk and NIRS (Near Infrared Spectroscopy)

The application notes in introduction provide information on importance of control on milk powder adulteration and economically motivated adulteration. As Milk powder is one of the most widely traded food commodities, with over 2.5 million metric tons exported annually, and is used in a huge array of food products, from infant formula to baked goods and confectionary. Unfortunately, dairy products are also a frequent target of food fraud, with 137 cases of economically motivated adulteration worldwide recorded by the United States Pharmacopoeia in 2011-2012. The value of milk powder is linked to its protein content, and standard methods for protein analysis rely on a simple nitrogen assay, with the protein concentration inferred from the nitrogen content. Consequently, the addition of chemicals rich in nitrogen can artificially increase the apparent protein and thus the price demanded.

The application note attracts our minds towards economically motivated adulteration of milk powder and towards hazard adulterants like melamine. It present NIRS method for qualitative identification of adulteration in milk powder. The algorithm and identification process are complicated but gives detail results. The drawback is that the method is costlier, and the basic elements used as source and detector for infrared are also costly. The microstrip antenna is comparatively inexpensive if it is used as basic sensor element.

The model is built for the unadulterated material, and the quality of match of the sample spectrum to this model is used to determine whether the result is a pass or a failure. While this approach is truly non-targeted and potentially sensitive to any adulterant, there is no indication of why a failing sample has failed (no identification of the adulterant) and, because the method makes no use of the adulterant spectrum, the sensitivity cannot be expected to be as high as for a quantitative method. Finally, methods that rely on conventional library searching even with multivariate algorithms suffer from an inability to model accurately the variation in the matrix and are often used with commercial libraries that may be of limited applicability.[5]

Review on Microstrip Antenna as a Sensor for Permittivity Measurement

An application of a small air-spaced coaxially fed rectangular microstrip patch antenna as a sensor for permittivity measurement is presented. The models used for the calculation of the permittivity from the shift in the resonant frequency for solid and liquid materials are described. The models are experimentally verified by measurements for several liquid and solid samples. In this work, for the first time, a patch antenna is used as a sensor for permittivity measurement. In comparison with microstrip line structures, the advantages of the microstrip patch are low profile, relative simplicity, ease of fabrication, and low price. For the solid material permittivity measurements, the sample under test is positioned on the top of the patch, forming the cover or superstrate material with thickness. The shift in resonant frequency due to the change in superstrate dielectric constant has been calculated. As the reference value, the PTFE resonant frequency is taken. The calculated shift in resonant frequency shows good agreement with the experimental result.

The microstrip patch antenna structure has been modelled by means of a modified cavity model, which offers approximative closed-form equations and a fast procedure for the determination of material permittivity. The structure has very good sensitivity, particularly for liquids, where the space between the patch and ground plane, and the space above the patch are filled with the liquid under test. It is well suited for remote measurements of low-loss materials. It is particularly well suited for monitoring changes in the dielectric constant of a material. The sensor is capable of permittivity measurement for a wide range of materials/permittivity values.

The accuracy of permittivity measurement is significantly influenced by the accuracy of the input impedance measurement. The accuracy of loss tangent data is significantly poorer when compared to the data obtained by dielectric probe, but not as compared with some data obtained and it needs more examination in the future. If more accurate results are to be obtained, the effect of dispersion must be included.[4]

Review on Study of dielectric properties of adulterated milk concentration and freshness

The dielectric properties were measuredwith a vector networkanalyzer open-ended co-axial line probeand X band (von-Hippel technique). Dielectric constant and lossfactor were calculated with MATLAB program dielectric probe kit software according to the reflectioncoefficient of the material in contact with the

active tip of the probe. Then electrical conductivity was determined using a conductivity meter.
The penetration depth increased with decreasing frequency, water content and storage time, which was large enough to detect dielectric properties changes in milk samples and provide large scale RF pasteurization processes. The study provides some constructive information for developing a fast & simple milk concentration and freshness sensor in food processing industry.
This study is at a particular frequency range and at fixed temperature i.e., at predefined values. [2]

III. METHODOLGY

Microstrip antennas has different shapes of patch, the most commonly used patch is rectangular. Circular and triangular patches also used widely. Microstrip antennas can be classified according to the shape of their patch. When the patch of microstrip antenna is shorted to the ground plane it size reduces to 50(percent). Now the microstrip antenna becomes Planer Inverted-F Antenna (PIFA). PIFA is used in mobile phones because of its compactness. The Planer Inverted-F Antenna (PIFA) are printed Inverted-F Antenna which monopole antenna running parallel to ground and shorted to ground at the end. It is a quarter wavelength shorted patch with limited ground plane and dielectric substrate in between.[1]

Microstrip inset Feed: In this type of feed technique, a conducting strip is connected directly to the edge of the microstrip patch as shown in figure 1.2. The conducting strip is smaller in width as compared to the patch. This kind of feed arrangement has the advantage that the feed can be etched on the same substrate to provide a planar structure. An inset cut can be incorporated into the patch to obtain good impedance matching without the need for any additional matching element. This is achieved by properly controlling the inset position. Hence this is an easy feeding technique since it provides ease of fabrication and simplicity in modeling as well as impedance matching. However, as the thickness of the dielectric substrate increases, surface waves and spurious feed radiation also increases, which hampers the bandwidth of the antenna. This type of feeding technique results in undesirable cross polarization effects.[1]

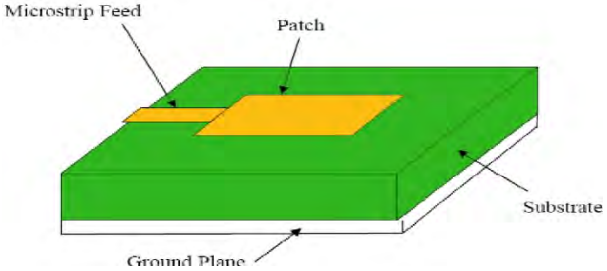


Fig. 2: Microstrip Inset Feed

The microstrip antennas has a specific resonant frequency on which it radiates efficiently. Also, it has narrow bandwidth. The resonant frequency of the microstrip antenna depend upon several factors such as its dimensions, permittivity of dielectric substrate, permittivity of superstrate, and temperature. Thus, the resonant frequency is affected when any of the above mention parameters are changed. Every matter has its dielectric constant also known as the permittivity of that material. Thus, milk also has the dielectric constant which is about 1.9. When the milk is adulterated its dielectric constant is changed. So non-adulterated milk powder has a specific permittivity which is being changed when it is adulterated. So, if we place the milk on the microstrip antenna it will work as a superstrate. Now the adulteration of the milk causes its dielectric constant to change which in turn effects the resonant frequency of the antenna. Thus, the adulteration of milk changes the resonant frequency of the antenna and we can detect whether the milk placed on the microstrip antenna is adulterated or not. The aim of this project is to only detect whether the milk sample is adulterated or not from the resonant frequency of microstrip antenna. Due to limitation of time, resources, and skill it is not aimed to explore the amount of adulteration or the details of adulteration. In this project effort is made to design the microstrip antenna as small as possible and feasible by using various miniaturization techniques. So that the microstrip antenna would be good enough to hold milk.[3]

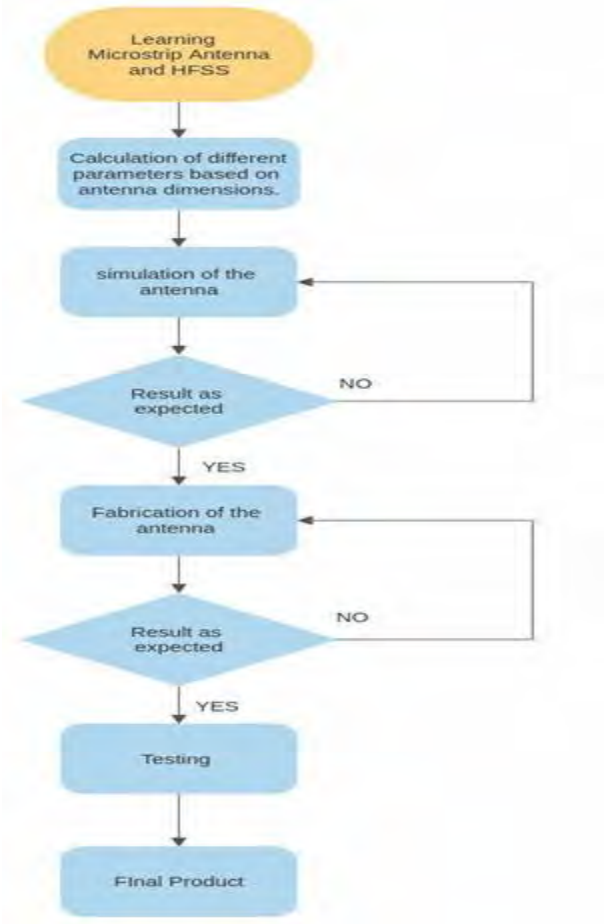


Fig.3: Data Flow diagram

IV. RESULTS

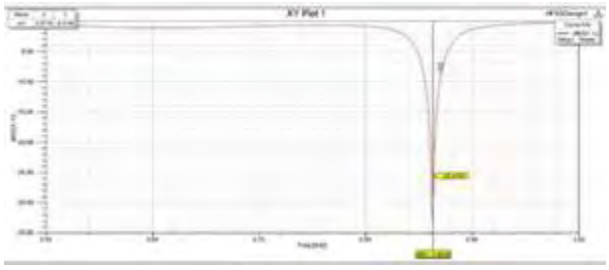


Fig.4: Simulation Output

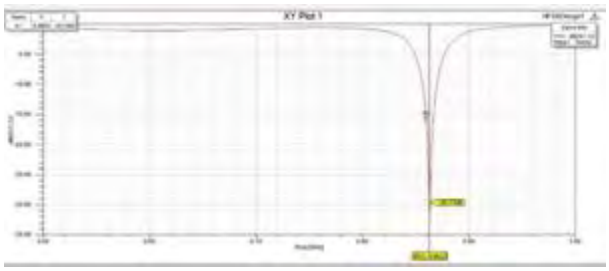


Fig.5: Output for Permittivity 1.8

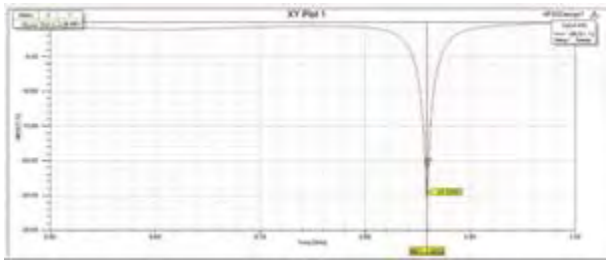


Fig.6: Output for Permittivity 1.9

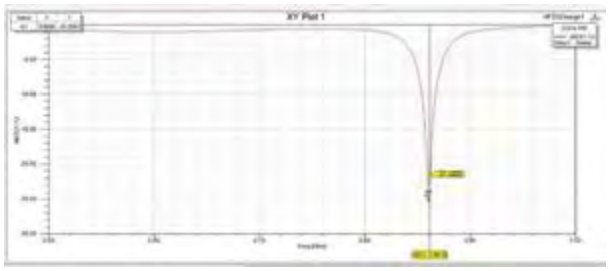


Fig.7: Output for Permittivity 2

Resonant Frequency Shift with Respect to permittivity of milk Samples for proposed antenna

Permittivity of Milk sample	Resonant Frequency (MHz)	S11 (dB)
1.8 (Pure milk)	863	-29.7105
1.9 (adulterated milk)	862	-24.5595
2 (adulterated milk)	843.8	-21.4859
2.2 (adulterated milk)	842.2	-20.5619
2.3 (adulterated milk)	841.2	-19.9731

Table 1: Resonant frequency shift w.r.t Permittivity

Simulation results:

Patch Length (L1) = 82.34mm
Patch Width (L2) = 105.3mm
Height (h) = 1.6mm
Dielectric Constant (er) = 4.4
Resonant Frequency (fr) = 864MHz
The Resonant Frequency is inversely proportional to the permittivity of milk powder sample.

V. CONCLUSION

The adulteration in the milk powder can be detected by using microstrip antenna sensor. The non-adulterated milk powder sample make antenna to radiate at specific resonant frequency. If the milk powder sample is replaced by adulterated milk powder sample the resonant frequency of the antenna changes and from the shift in resonant frequency the milk powder sample is detected to be adulterated. Summarizing the result and discussion, the relation between the permittivity of the milk powder sample and the resonant frequency is inverselyproportional to each other.There is a shift in the resonant frequency of the microstrip antenna sensor when the non- adulterated milkpowder sample is replaced with adulterated milk powder sample. The microstrip antenna sensor has resonant frequency of 865.9 MHz .

REFERENCES

[1] Sourabh Bisht, “Study the Various Feeding Techniques of Microstrip Antenna Using Designand Simulation Using CSTMicrowave Studio”, International Journal of Emerging Technology and Advanced Engineering (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 4, Issue 9, September 2014)

[2] V. Jitendra Murthy,” Study of dielectric properties of adulterated milk concentration and freshness” 2007 IOP conf. ser: Mater. Sci. engg.

[3] Usman A. Khan, Nicholas Nguyen, and Mohammed N. Afsar, “Millimeter- and Submillimeter- Wave Dielectric Measurements of Household Powders Using Fourier Transform Spectroscopy”, IEEE Transactions on Instrumentation andMeasurement, Vol. 57, No. 2, February 2008.

[4] Mirjana Bogosanovich, “Microstrip Patch Sensor for Measurement of the Permittivity of Homogeneous Dielectric Materials” IEEE Transactions on Instrumentation and Measurement, Vol. 49, No. 5, pp. 1144-1148, October 2000.

[5] Ben Perston and Rob Packer, “DairyGuard: Augmenting Nutritional Testing of Milk Powder with Adulterant Screening”, published by PerkinElmer Inc. Shelton, CT, 2013

2x2 Array of Monopole Antenna for Gain Enhancement

Kartik Maurya
Dept. of Electronics and Telecommunication.
Thakur College of Engineering and technology.
Mumbai, India
kartikmaurya098@gmail.com

Gaurav Jain
Dept. Of Electronics and Telecommunication
Thakur College of Engineering and technology
Mumbai, India
jaingaurav1029@gmail.com

Prem Pal
Dept. Of Electronics and Telecommunication
Thakur College of Engineering and technology
Mumbai, India
prempal101@gmail.com

Shailendra Shashtri
Dept. of Electronics and Telecommunication.
Thakur College of Engineering and technology.
Mumbai, India
shastri_shailendra@rediffmail.con

***Abstract*—This work describes the design and analysis of a 2x2 antenna array designed using a meander monopole antenna. The primary goal of this work is increasing the overall gain of the antenna by using the antenna array method. The antenna used in this work is a meander monopole antenna and the resonant frequency selected to work with is 2.4 GHz. A 2x2 antenna array will be formed. Lower the dielectric constant, higher the gain of the antenna hence glass epoxy with a dielectric constant of 4.3 is used in this project. For power division purpose, Wilkinson power division technique is being used. For impedance matching, Quarter Wavelength Transformer is used. The antenna is designed on a CST studio suite. The antenna is useful in applications where a highly focused beam is required, that is an antenna that has a large major lobe and no or less side lobes.**

Keywords—2x2 Antenna array, Wilkinson power divider, Meander monopole antenna, Gain enhancement, CST studio suite.

I. INTRODUCTION

Wireless communication system antennas play a very important role in transmitting and receiving information at different frequencies. In antennas, Gain is the most important feature. Higher the gain of the antenna, better and focused is the beam obtained at the output end. In this work the concept of antenna array is being utilized where a number of antennas are framed in a network or topology to act as a single antenna and hence this is the primary way of increasing the antenna gain. Monopole meander antenna is chosen for this project. Secondly, for power division, Wilkinson power division technique

is being used. for impedance matching, a quarter wavelength transformer is being used in this project. The major reason behind this is, it can be used to match any load impedance to a transmission line. The bandwidth of the antenna is also being reduced which will also help in increasing the gain of the antenna further. Lower the dielectric constant of an antenna higher is the gain of the antenna. The dielectric material chosen for this work is Glass Epoxy with a dielectric constant approximately equal to 4.5. The operating frequency with which work will be done is 2.4 GHz. This idea is also practically implementable, as this technology is inexpensive, can be easily integrated in feed networks and provides adequate beam width. The main drawback of using such an antenna is limited bandwidth. The antenna that will be designed, will be small in size, hence, the installation of this antenna will also be easy to handle. The product or the designed antenna can be used in applications where a highly focused beam is required. For example, it can be used for scanning products (bar codes), capturing number plates of moving vehicles, and security applications. The formulation and simulation of the antenna will be done in the CST studio suite. The circuitry will be mounted onto a PCB to achieve the final product.

II. SCOPE

The future offers endless possibilities for advancement of the prototype. The antenna designed has a high gain and hence has an industry application where scanning is required.It can also be implemented for security applications.It will be useful in application where in a highly focused beam is required(i.e.it should have larger main lobe and no or lesser side lobes).One of the key area to implement the project is at the toll naka to capture the number plates of moving vehicles which will decrease the traffic intensity.For the fact of antenna not capturing multiple number plates at a time,one antenna will be dedicated to a single lane so that only one vehicle's number plate is captured at a go.

III LITERATURE SURVEY

The Antenna Designed has a high gain and hence can be used in application for WLAN and other applications as per the gain requirement. However, this work has some gaps. The major gap is that the results from the measurement were not accurately the same as in the simulation. Also the gain of the antenna for 2×2 antenna was less as compared to another tested patch antenna[1]. The solution that can be used is by using a very compact and low-cost new design can be realized because of the integrated feeding network structure in which extra radiating elements can be etched off for the purpose of achieving best results in the steering direction.

A meander monopole antenna array based electromagnetic band gap (EBG) structure can be

proposed for MIMO applications. This is achieved by having a negative refractive index (NRI) to reflect the surface waves For this, two monopoles of a meander structure are printed on an FR4 substrate of 1.6 mm thickness and fed with 50 microstrip lines[2]. The gap that was pointed out was that the efficiency of the designed antenna was less as compared to the stimulated results. Literature Survey.

The designed slotted patch array antenna obtained high gain ranging from 79.29% improvement to 7.6%, and the only gap being that the bandwidth improved didn't result in a wider bandwidth [3]. Future work is recommended to focus on improving wider bandwidth but retaining the compact size and high gain.

A novel two-antenna blade array with reduced mutual coupling between two input ports for UAV application is proposed for IEEE 802.11 b/g/n and 802.16 Wi-MAX standards. The proposed antenna consists of one vertical monopole and a horizontal dipole with port-to-port separation of nearly 0.60[4].

A very compact and low-cost new design can be realized because of the integrated feeding network structure in which extra radiating elements can be etched off for the purpose of achieving best results in the steering direction [5].The project will be beneficial as improved gain results will benefit WLAN applications

IV METHODOLOGY

First, the effects of cross-sectional dimensions and dielectric constant on characteristics of microstrip line impedance were analysed simulation of this part was carried out on the Z-Line software.

The following procedure was followed for analysing the effects:

1) h and εr kept constant and w is varied in multiple steps to analyze its impact on characteristic impedance.

2) w and εr kept constant and h is varied in multiple steps to analyze its impact on characteristic impedance.

3) w and h kept constant and εr is varied in multiple steps to analyze its impact on characteristic impedance.

The techniques such as parasitic patch and slot cutting are also used to improve the impedance matching of antenna, thereby resulting in multiband and broadband performances.

Antenna array concept is used to improve the better gain of different antennas by nullifying the side lobes. This method also helps with a 2x2 antenna array for getting higher gain[7]. By improving the output array antenna can be used in WLAN applications. CST software is used to test working of array antennas. Air gap and perfect dielectric substrate material helps to reduce the propagation of surface wave effects on antennas[8].

2. Defected ground structures concept has been developed recently and they are achieved by engraving a simple defect of any shape on the ground plane. Due to these structures the current is disturbed in the ground plane. This ultimately results in handling excitation and propagation of radio waves across the substrate layer. The defect in ground can be changed accordingly from simple shape to complex shape in order to achieve desired performance. In 2x2 antenna arrays, defective ground structures have numerous advantages in the field of transmission lines, couplers, dividers, power amplifiers[8].

By using the defective ground structure in 2x2 antenna size can be reduced significantly. Bandwidth of the 2x2 antenna can also be increased. One major advantage of this is it doesn't affect the size of the antenna. Making it easy to use and install[6].

V. DATA FLOW DIAGRAM:

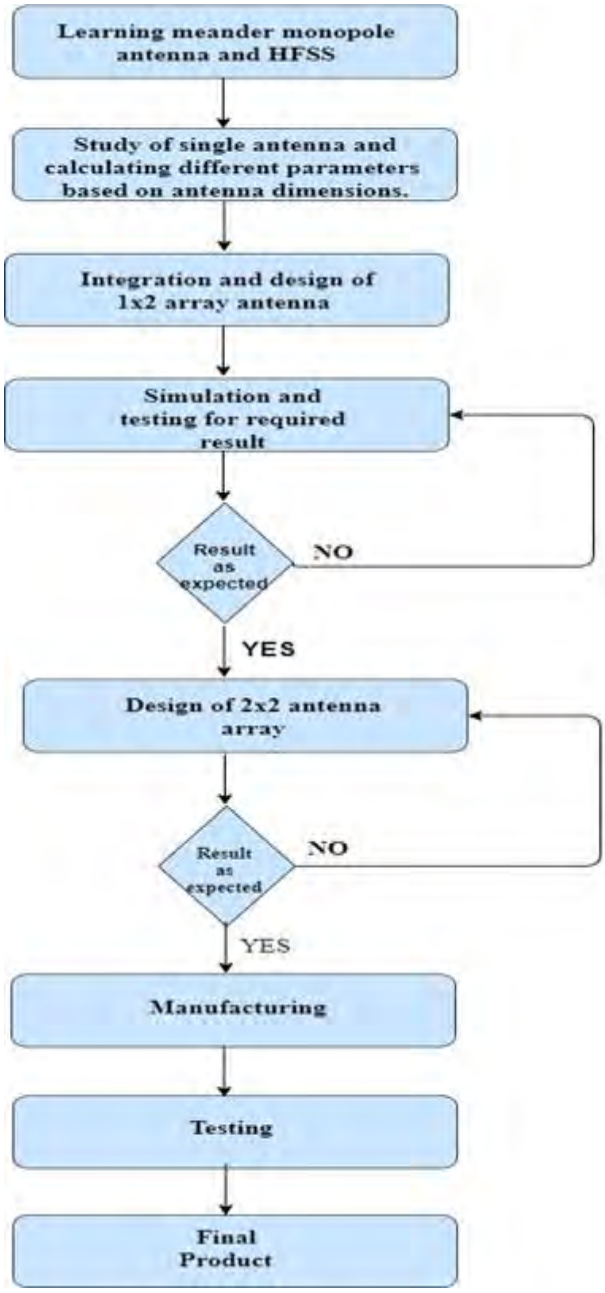


Figure 1. Simulation Steps

VI RESULT

h_s=0.3	e_r=4.7
w	Z0
0.2	72.42
0.4	54.4
0.6	44.03
0.8	37.14
1	32.18
1.2	28.42
1.4	25.48
1.6	23.09
1.8	21.13
2	19.47
2.2	18.07
2.4	16.85
2.6	15.79
2.8	14.86
3	14.03
3.2	13.3
3.6	12.03
3.8	11.49
4	10.99

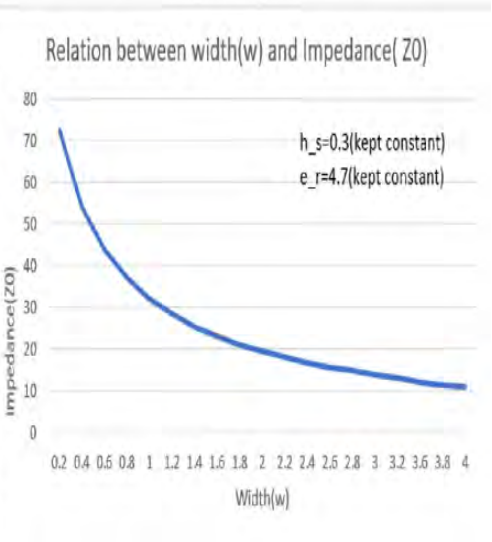


Figure 2. Relation between width and Impedance.

On analyzing it was found that the closed microstrip line impedance was found to decrease with an increase in width(geometrical parameter)

w=3.2mm	e_r=4.7
h_s	Z0
0.4	16.96
0.8	29.26
1.2	38.92
1.6	46.85
2	53.54
2.4	59.32
2.8	64.4
3.2	68.92
3.6	73
4	76.72
4.4	80.13
4.8	83.28

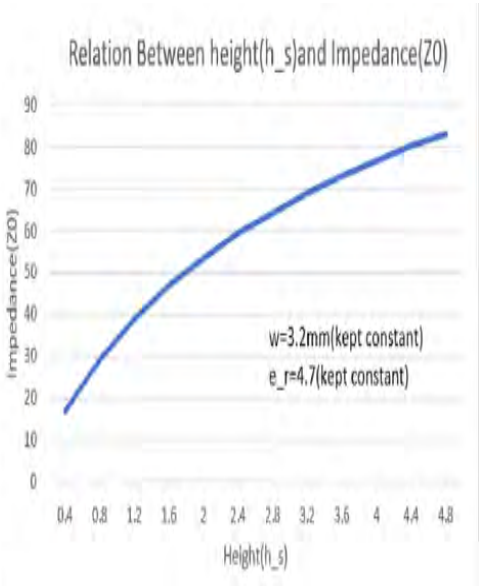


Figure 3. Relation between height and Impedance

On analysing the second parameter it was found that the impedance value decreases as the value of dielectric constant increases.

w=3mm	h_s=1.6mm
e_r	Z0
1.2	84.57
1.5	77.95
2	69.78
2.2	67.18
2.4	64.85
3	59.12
3.5	55.36
4.4	50.11

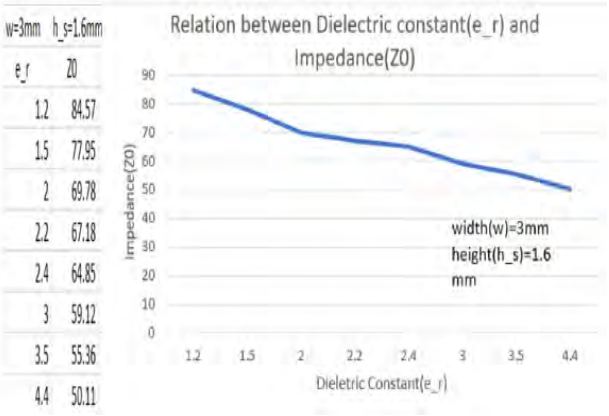


Figure4.Relation between dielectric constant and Impedance

On the other hand, the impedance decreases with the increase in the height of the substrate. The results are as shown:

VII. EXPECTED OUTPUT

The gain of individual meander monopole antennas is expected to be around 1.5dbi, hence the overall gain of the designed antenna array is expected to range in between 3.5-4.5 dbi. The dimension of the antenna is expected to be around 0.5 feet * 0.5 feet which will be less as compared to the size of general antennas which are around 1.25 feet * 1.25 feet, all due to the usage of meander monopole structure.

Lastly, we will have high efficiency (70% to 82.36%) which is a major disadvantage in the MSA as its efficiency is very low (less than 30 %).

VIII FUTURE SCOPE

The work can be extended further by using the same technique for designing higher order of a monopole antenna array.Further work can be done to implement the applications of the antenna array in the field of RFID,safety and security purposes.

IX. CONCLUSION

Hence on successful completion of this work, an antenna array will be designed which will have an improved and high gain. The usage of monopole antenna is preferred over microstrip antenna (MSA) because the efficiency of monopole antenna is much higher. Also, the size of the antenna will be reduced while at the same time the radiation distance will be significantly high as compared to the MSA, thus, it will be used in applications where a highly focused beam is required. The finally designed antenna will be mounted onto a PCB. The designed antenna array can be used specifically at toll stops for monitoring and recording the number plate of the vehicle using RFID integration. The object tracking application of the antenna can also be used for other measurements at the toll stops, and baggage tracking in the airport, the size of the antenna will be small and it will be cost efficient.

X.ACKNOWLEDGEMENT

We would like to express our gratitude to all those who gave us the possibility to complete this paper.We would like to thank our final year project coordinator, Mr.Shailendra Pratap Shashtri, whose help, guidance and motivation, helped us to coordinate our project especially in writing this paper.We would also like to appreciate the role of the staff of Electronics and Telecommunication Laboratory, who helped us with the required apparatus and materials to complete our work.We also thank the HOD, Dr. Payal Saha, Dean Academic, Vice Principal, Dr Deven Shah, The Principal, Dr B.K. Mishra for their support.

REFERENCES

[1]Norfishah Ab Wahab, W. Nor Syafizan W. Muhamad, Zuhani Ismail Khan, Suzi Seroja Sarnin,"Microstrip array antenna with inset-fed for WLAN application",Faculty of Electrical Engineering, Universiti Teknologi Mara (UiTM), Malaysia,Vol. 17, No. 1, January 2020, pp. 340~346

[2] Zainab Al-Dulaimi, Taha A Elwi & Dogu Cagdas Atilla,"Design of a Meander Line Monopole Antenna Array Based Hilbert-Shaped Reject Band Structure for MIMO Applications",, IETE Journal of Research .

[3]Dr. Sathish Kumar Selvaperumal"High gain 2x2 Slotted array antenna for 5G Mobile applications",Asia Pacific University of Technology and Innovation .

[4]Ardra George,"Design and Analysis of 2x2 Blade MIMO Antenna for UAV Communication ",Ardra George Junior Research Fellow (JRF), CABS, DRDO Bangalore, India.

[5]Mona El Abbasi and Mervat Madi , Mohamad Farran , Youssef Nasser and Karim Y. Kabalan," Gain Enhancement of Antenna Arrays with BeamSteering",Department of Electrical and Computer Engineering American University of Beirut

[6]Alok kumar ,Nancy Gupta,P.C Gautma,"Gain and Bandwidth Enhancement Techniques in Microstrip Patch Antennas - A Review",International Journal of Computer Applications (0975 – 8887) Volume 148 – No.7, August 2016

[7]D. R Jahagirdar and R D. Stewart, "Non-Leaky Conductor Backed Coplanar Wave Guide-Fed Rectangular Microstrip Patch Antenna," IEEE Microwave and Guided-Wave Letters. Vol 3, pp. 115- 117, Mar. 1998.

[8]A. Balanis, "Antenna Theory Analysis and Design, 3rd Edition." John Wiley & Sons, 2005.

A Review on Size Reduction Techniques and Challenge in Nonuniform Loop Antenna

Siddhant Jaiswal
E&TC Department
Thakur college of Engineering Technology,
mumbai.
Siddhant2502@gmail.com

Akash Pathak
E&TC Department
Thakur college of Engineering Technology,
mumbai.
pathakakash006@gmail.com

Manan Rathod
E&TC Department
Thakur college of Engineering Technology,
mumbai.
mananr947@gmail.com

Shailendra P. Shastri
E&TC Department
Thakur college of Engineering Technology,
mumbai.
shailendra.shastri@thakureducation.org

***Abstract*— In this paper various antenna size reduction techniques are analyzed and compared. Also, some of the techniques to reduce the size of the nonuniform loop is proposed. The paper also covers the challenges with balanced antenna when size reduction is the aim.**

Keyword— shorting pin, loop antenna, dipole, monopole, defected ground structure.

I. INTRODUCTION

The continuous advent in the area of technology has witnessed acontinues reduction in the size of electronics products. Antenna is one of the essential components in wireless communication and is used to transmit and receive EM energy. Fortunately, antenna size is proportional to wavelength and the incoming technologies are efficient enough to give high frequency devices which has led to use of upper abundantly available frequency bands. Higher frequency signals are of very small wavelength and therefore the antenna size is smaller.

Sometimes despite of smaller size of antenna it is required to reduce the antenna size further to make overall system highly compact special techniques are searched and there are multiple literatures are available on this area. In this paper such multiple techniques are brought together for reference purpose and can be helpful to the researcher contributing is the similar area.
Other than this a nonuniform loop antenna is taken into consideration and limitations of the existing techniques are pin pointed with reference to the considered balanced nonuniform loop antenna. Some of the possible methodologies are also proposed here for the reduction of the antenna.

II. CONVTIONAL SIZE REDUCTION TECHNIQUES

Printed microstrip antennas (MSA) are considered as first antenna existing on copper clads. These antennas have contributed a lot in communication area since long and are modified from time to time to fulfil various requirements such as high gain, broader band and narrow beam using various techniques.

A compact rectangular microstrip antenna embedded with open-ended ground slots is presented in Fig.1. Three equal open-ended ground slots have been incorporated inside the ground plane in order to excite the antenna with a lower order resonant mode. On variation of the length parameter of the middle slot of the antenna, a resonant mode of lower order has been obtained near 1.52 GHz. The maximum size reduction of the designed structure is obtained, considering the lower band resonant frequency obtained is about 85.83% with a fractional bandwidth of 6.97%,[1]

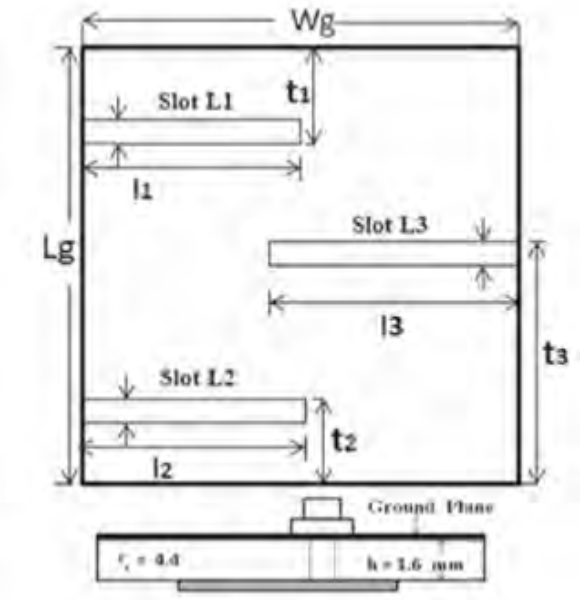


Fig.1. Slotted ground patch antenna

Similar technique is applied to patch antenna along with a new technique called as shorting pin. Shorting pin is applied to a location where the electric field along the antenna is zero and the remaining part of the antenna is removed without any change in the overall performance of the antenna other than gain of antenna. Fig. 2 shows a patch loaded with a shorting pin. This reduces the size of the antenna to 50%.

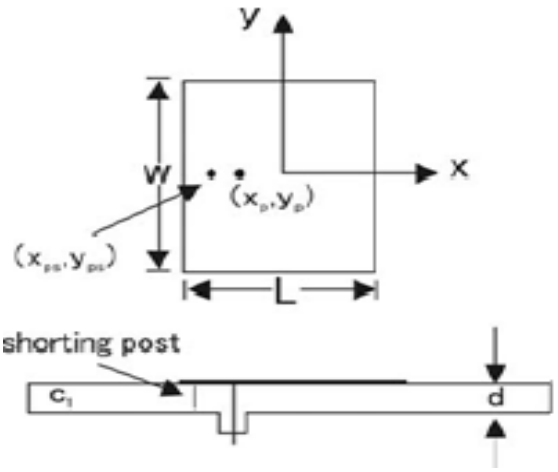


Fig.2. Patch antenna loaded with shoring pin.

Further reduction of the antenna is achieved by using meander structure of the patch itself. The combined technique is used to reduce the overall size of the antenna as shown in Fig. 3.

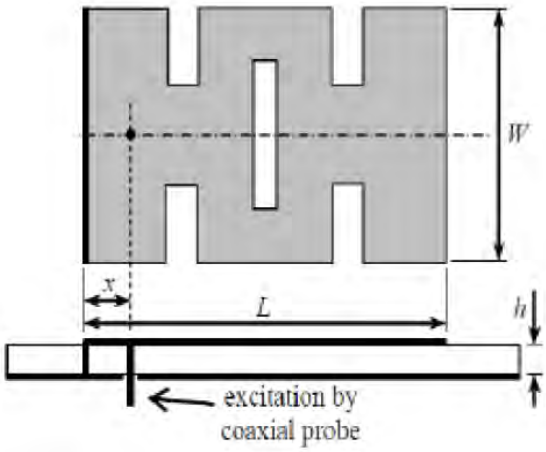


Fig. 3. Patch loaded with pin and meander shape patch.

Here it is important to emphasize that the antenna efficiency and gain depends on the antenna size and since the size of the antenna is reduced to a greater extent, therefore, it is certain that the modified antennas are going to loose these features and antennas can be useful to applications where size matter more than the mentioned parameters.

Fig.4 shows another antenna with completely different technique. The aantenna proposed is a TV White Space frequency band. Monopole antenna incorporating meander lines and defected ground structure are proposed in this paper. The antenna is designed on Rogers RO3203 substrate fed by microstrip line over defected ground structure. Meander lines and defected ground structure techniques are combined together to reduce the physical size of proposed antenna and to enhance the performance. Meandering structure helps in increasing effective electrical length while defected ground structure provides improvement in bandwidth [1].

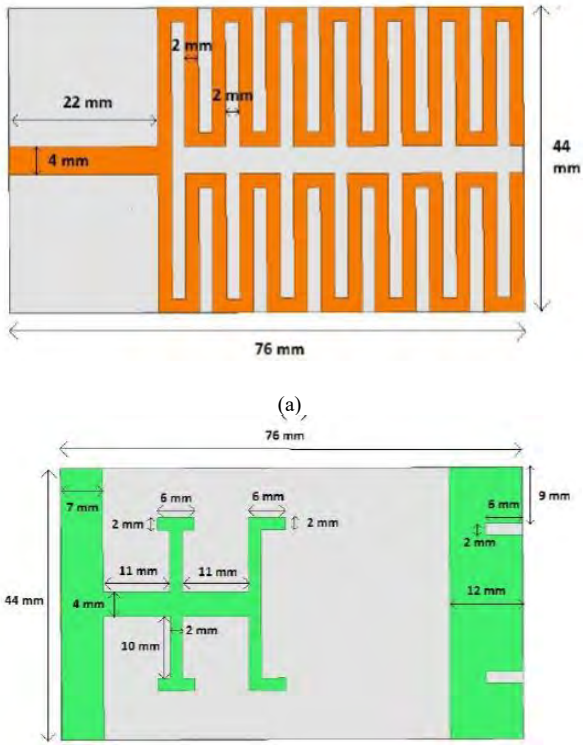


Fig. 4. (a) Meander Line Patch and (b) Ground Plane.

A monopole antenna is a straight structure and occupies linear space and sometimes it makes overall size of the product too big if operating wavelength of antenna is very large. In order to reduce the size of the monopole antenna different techniques are proposed in literatures. The size of the antenna can be reduced using a meander structure than a straight linear wire [2]. The size of the antenna can be reduced significantly using this technique but at the cost of efficiency of the antenna,
Fig. 5.

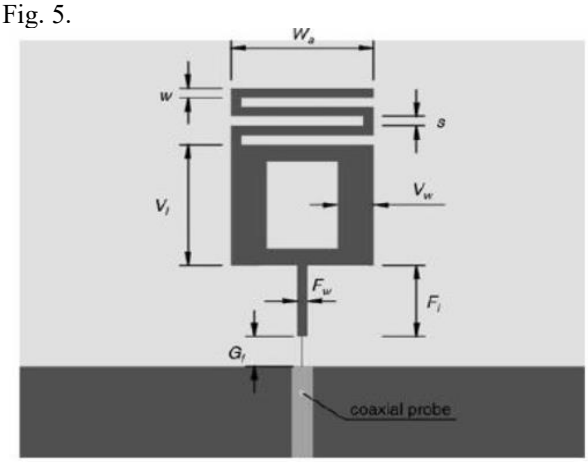


Fig. 5. Meander monopole.

III. CHALLENGES IN SIZE REDUCTION OF NONUNIFORM LOOP AND SOLUTION

Nonuniform loop antenna shown in Fig. 6 is a balance antenna i.e., it has two feeding points unlike microstrip printed and monopole antennas considered earlier therefore it does not contain any ground plane. It can be observed that size reduction techniques covered in earlier section prominently show that the ground plane plays

important role in the size reduction of antenna. Since the loop does not contain any ground plane there is no scope to experiment in this respect. Other technique is to use meander line technique which can be applied to the loop circumference and instead of having smooth circular shape antenna can be incorporated with meander cuttings along the circumference and size can be reduced. This technique seems to be plausible but there is threat of loosing inherent property of loop in terms of bandwidth of the antenna which is ranging from 3.4 GHz to 9.1 GHz.

Another technique is to work on the feed gap of antenna. Fig. 6 shows the structure of the loop antenna and it can be observed that feed gap is of 6.5 mm wide.

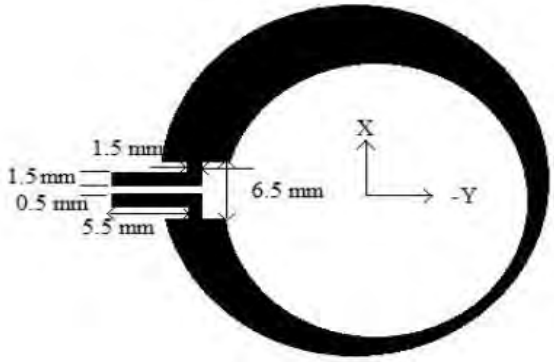


Fig. 6. Nonuniform loop antenna

This wide gap actually reduces the overall circumference of the loop. Circumference of the loop antenna is directly proportional to the wavelength of the operating frequency of choice.

Therefore, reduction is the circumference of the loop supports a smaller wavelength which means a higher frequency. Therefore, to reduce the frequency of antenna without changing overall dimension of the loop, if the gap could be reduced then this will lead to increase in the circumference of loop and antenna can be operated at lower frequency.

IV. CONCLUSION

There are multiple techniques to reduce printed antenna but the nonuniform loop antenna being balanced in nature does not contain any ground plane. This leads to difficulty in the size reduction of loop antenna. A novel method is required to reduce the size of the loop and this will lead to wider application of the loop in ultrawide band antenna.

REFERENCE

[1] Sanjeev Kumar, Ajinkya Joshi and Neela Rayavarapu "A Compact Monopole Antenna using Meander Lines and Defected Ground Structure for applications in TV Band" , Progress In Electromagnetics Research, vol. 98, p. 53-73. 1998.

[2] J. Jung, H. Lee and Y. Lim "Modified meander line monopole antenna for broadband operation" ELECTRONICS LETTERS 25th October 2007 Vol. 43 No. 22.

[3] Bappadittya Roy et.al. "Size miniaturization of microstrip antenna embedded with open-ended ground slots" J Comput Electron DOI 10.1007/s10825-017-0995-6.

[4] Deepak Moghariya, Mr. Tejas Kothari and Prof. M. P. Patel "Miniaturisation Method to Reduce the Size of Microstrip Antenna for Lower Frequency" International Journal for Scientific Research & Development (IJSRD) | Vol. 1, Issue 1, 2013 | ISSN(online): 2321-0613

This page is kept blank intentionally

Array of Non-Uniform Loop Antenna

Anjali Gupta
E&TC Department
Thakur College of Engineering & Technology
Mumbai, India
guptaanjali844@gmail.com

Harshada Hariyan
E&TC Department
Thakur College of Engineering & Technology
Mumbai, India
harshgit24@gmail.com

Shubham Yadav
E&TC Department
Thakur College of Engineering & Technology Mumbai, India
sshubhamyadav81@gmail.com

S. P. Shastri
Assistant Professor
Thakur College of Engineering & Technology
Mumbai, India
shailendra.shastri@thakureducation.org

***Abstract*— Array antennas are useful wireless communication component. In this paper, challenges in the design array of the non-uniform loop antenna are into consideration. Loop being balanced in nature requires to be fed with BALUN transformer which is a major challenge is considered here. The loop radiates for a larger elevation angle, therefore, an appropriate array configuration is proposed here to confine radiation in smaller beam angles. Other than that application of the proposed array is also covered in the paper.**

Keywords— Array, Balanced antenna, Balun transformer, Loop antenna, Micro-strip line, Quarter wave transformer

I. INTRODUCTION

Working on loop antennas is one challenging task considering there are many necessities needed to be fulfilled. Ultra-Wide Band loop antennas have attractive features such as low maintenance, large channel capacity, low interference to legacy systems, highly immune to multipath interference, less probability of interception and detection, higher accuracy in range measurement and range resolution. Also, controlling phase and distance parameters helps to control the form of the beam radiated by the antenna. A non-uniform array acquires a performance similar to a uniform array using a smaller number of physical elements. A non-uniform array has irregular spacing between consecutive elements in the array. A quarter-wave impedance transformer uses a transmission line with different characteristic impedance and with a length of one-quarter of the guided-wavelength to match a line to a load. Power divider divides the power equally in all antennas. Loop antenna used is a balanced antenna, so it cannot be fed with a microstrip transmission line (unbalanced in nature). So there is a requirement for Balun Transformer. Balun Transformer is a means that converts between a balanced signal and an unbalanced signal.

II. LITERATURE SURVEY

The proposed non-uniform loop antenna covers a band of 91.4% which is higher than any existing printed loop antenna with the frequency range from 3.54GHz to 9.5GHz. This technique can be very helpful in designing UWB antennas. The proposed work failed to give any justification on the enhancement of bandwidth and the impact of proposed shape on the antenna radiation pattern was not considered. To enhance the bandwidth of the loop antenna is designed at very high frequency using conventional PCB design technique. [1]

In this paper, a novel capacitive coupled patch antenna array capable of providing high gain and 360degree coverage in the elevation plane is proposed. This paper reports a comprehensive study of the capacitive fed patch antenna and the array configuration, its practical implementation and test. This work includes bandwidth enhancement, extracting current modes using the Theory of Characteristic Modes and the antenna design parameter study. Principle of operation is followed then the equivalent circuit model created using characteristic mode analysis. With design parameter study the array antenna is designed and 3 performance and bandwidth enhancement are seen using the software. [2]

The objective of this paper is to inspect the high performance in terms of gain and directivity of array patch antenna based on metamaterial superstrate. Due to negative refractive property of metamaterial the designed antenna is using a superstrate that has the capability of producing high performance in terms of gain and bandwidth. A gain enhancement of 2x2 antenna array has been attained by using the DNG metamaterial as superstrate above the antenna. This proposed structure has been simulated and examined on the software HFSSTM. [3]

This paper gives an comprehension into the introduction on Microstrip patch Antenna. Also, its objective is to design rectangular Microstrip Patch Antenna with Microstrip Feed Line theoretically and to design a microstrip patch antenna with the microstrip feed line (inset-fed) for Wi-Fi 2.4 GHz on Computer Simulation Technology (CST) software. [4]

In this article, general investigation on the relationship of efficiency and beam patterns are assessed to prove that maximum efficiency is accomplished when radiation patterns fulfil a given orthogonality condition. Under this condition, we propose to apply a unitary matrix transformation to the array response that can translate the compact antenna array behaviour into the equivalent response of a spaced ideal antenna array without modifying its total efficiency. Consequently, a useful compact antenna array should be designed to have orthogonal radiation beams. Then, try the transformation so that they can be translated to another orthogonal radiation patterns set with only phase differences and a common gain pattern. Simulated results of a computer-aided design of a practical array of Global Navigation Satellite Systems microstrip antennas are presented. [5]

Arrays can be used to synthesize a required pattern that cannot be achieved with a single element. The

mathematical arrangement, quantity of elements, phases of the array elements and relative amplitudes rely on the angular pattern. Focus of this paper is on the issues related to the design and implementation of 4×1 array microstrip antenna with aperture coupled corporate feed for wireless local area network applications. Parametric analysis with a change in element spacing is aimed in this work to comprehend the directional characteristics of the radiation pattern. A gain of more than 14 dB and the efficiency of more than 93% is achieved from the current design at the desired frequency band. [6]

This paper presents a simple array antenna with four circular patches on a square ground plane. These four radiating patches are fed by four coaxial probes. This array antenna can radiate practically at the resonant frequency of 14 GHz, the minimum return loss at the resonant frequency is -13.54 dB. The practical bandwidth at -10 dB is 8.15 GHz. The novelty of the work is that a high gain of 11 dB is achieved by this array antenna. [7]

III. SCOPE

There is scope to explore this area because this area has not that been deeply explored hence very least number of literature are available on loop antenna. The directivity of this antenna in phi plane is very small as compared to that of theta plane. So making an array of this antenna will lead to very sharp beam in phi plane as compared to the existing micro-strip antenna.

IV. IMPORTANCE

The High gain antenna array is an important design-based project. Fewer papers and projects have been contributed to this topic. Being said that let's take one step ahead with the possibilities we can design high loop antenna array.

The importance of this paper is to design a high gain loop antenna that can be used in various applications where the size of the antenna required is small and the gain required is high. We will be trying to implement a maximum of advantages and find a way to minimize the disadvantages.

V. FLOWCHART

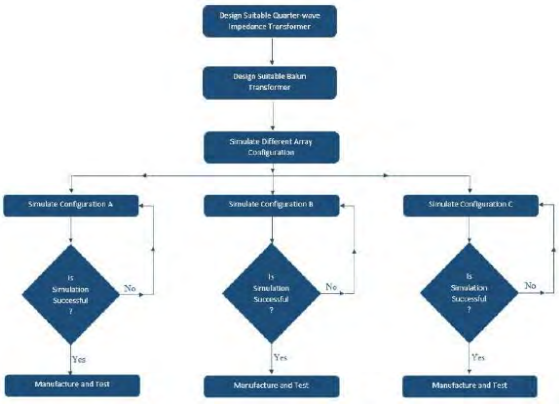


Fig. 1. Flowchart

VI. METHODOLOGY

The below figure is the antenna which is going to be used.

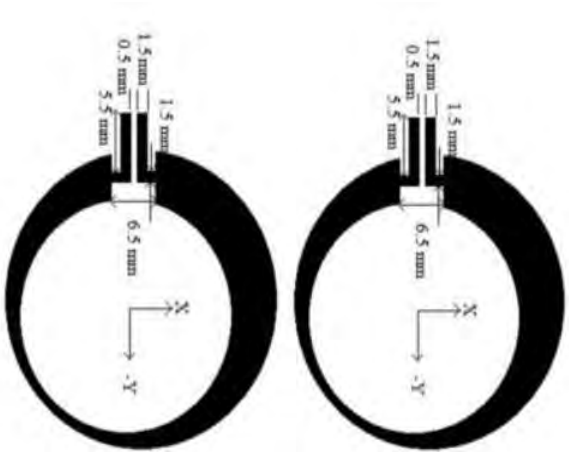


Fig. 2. Loop Antenna

Four antennas are designed in the linear configuration as seen in figure 6.2. Power divider is used to convert a single input to multiple outputs. Power gets divided among all four antennas. In terms of its application, the length is an important factor to be considered. The drawback of this configuration is the large space. Length can take up to 1 foot of space. To overcome this problem 2x2 antenna array can be used.

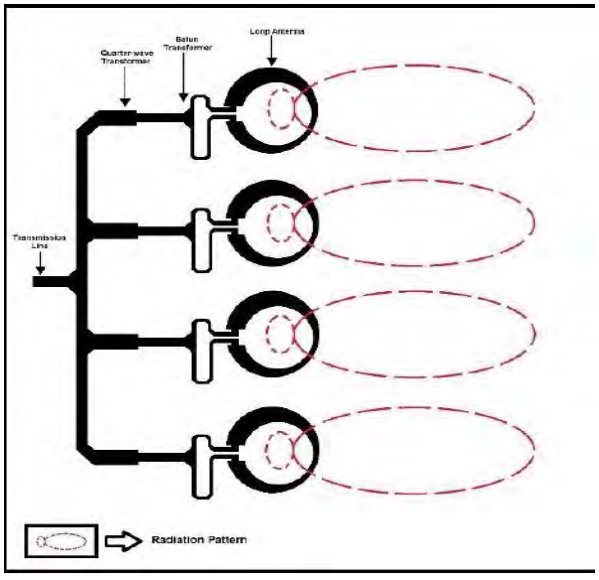


Fig. 3. Configuration A- Linear array using single feed to 4 outputs divider

According to fig 6.3 configuration, antennas are arranged in the 2x2 array. Single fed is used to provide power to all the antennas. Power divider is applied to obtain the accurate pattern of the design required. The radiation of all these antennas overlaps the printed circuit board (PCB). The drawback of this configuration is the overlapping of radiation.

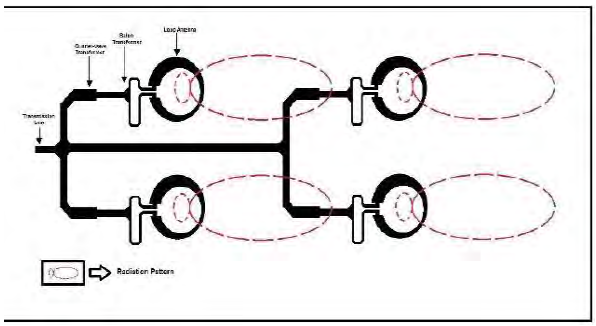


Fig. 4. Configuration B- Single input to 2 outputs (1x2 array)

The above figure 6.4, shows the configuration of antennas arranged in the stack. Single source input gives a double output. Power divider should be used for dividing the power to all the antennas. The radiation of all antennas is in the same region and direction. Therefore the radiation obtained is large. The result gives the single beam and narrow beamwidth. Single beam width narrow beamwidth provides the high gain. Narrow beamwidth gives more power that leads to a large gain.

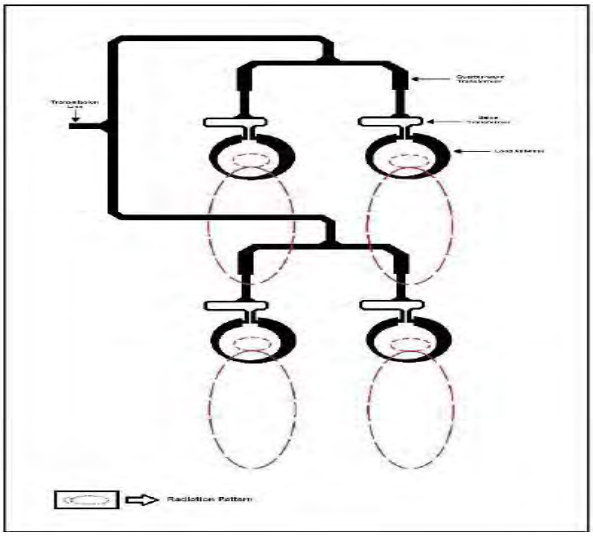


Fig. 5. Configuration C- 2x2 array using the stack of 1x2 array

VII. APPLICATIONS

Ultra-Wide Band technologies enable a very wide-ranging set of applications such as Sensor and imaging applications, Communication applications, Hybrid application as a blend of sensor and communications. Motion and presence detection in the field of home automation is a fast-growing application sector. Current technologies like passive infrared or continuous wave radar sensors have different drawbacks like sensitive lenses, coarse recognition qualities of temperature dependencies. Ultra-wideband sensors can combine the advantages of different sensor technologies. These can be invisible mount behind non-metallic covers, high-precise detection and distance measurements of movingobjects. Such features make a UWB sensor outstanding for outdoor motion and presence detection. Additionally, smart cities parking system sensor, Train crossing security sensor, Living object protection (LOP) systems for wireless electrical vehicle (EV) charging (WEVC), Industrial Asset tracking, Concrete inspections imaging, Food Technology, Short-Range Radar (SRR) and LRR are more examples where UWB loop antennas can be used.

VIII. EXPECTED OUTCOME

The expected result is that since all the power will be passed in a single beam so the more gain will be achieved. also, the spacing is done in a way that beam width will be less so if the existing kind of antenna has achieved 5dBi of gain so this project expected outcome should around 8dBi-12dBi gain.

IX. ACKNOWLEDGEMENT

We would like to express our gratitude and appreciation to all those who gave us the possibility to complete this report. A special thanks to our coordinator, Mr Shailendra Pratap Shastri, whose help, stimulating suggestions and encouragement, helped us to coordinate our project especially in writing this report. We would also like to acknowledge with much appreciation the crucial role of the staff of Electronics and Telecommunications Laboratory, who permitted us to use all required apparatus and necessary materials to complete our project. We thank the HOD, Dr Payel Saha, Vice Principal, Dr Deven Shah, Principal, Dr B. K. Mishra for their support.

REFERENCES

[1] S. P. Shastri, R. R. Singh, K. V. Ajetrao," Nonuniform C-Band Loop Antenna A New Approach for Future UWB Applications", Engineering, Technology & Applied Science Research, Vol. 8, No. 5, pp. 3496-3501, 2018

[2] Manoj Stanley, Yi Huang, Hanyang Wang, Hai Zhou, Ahmed Aliedin, Sumin Joseph, "Capacitive Coupled Patch Antenna Array With High Gain and Wide Coverage for 5G Smartphone Applications", IEEE Access, vol. 6, pp. 41942-41954, 2018.

[3] S.Gamouh, A.Chaabi, "Design of 4 Elements Rectangular Patch Antennas with High Gain", International conference on recent Advance in electrical systems (ICRAES), Tunisia, 2016, ISBN: 978-9938-14-953-1.

[4] Khaleel, Aymen, "Design and Simulation Microstrip patch Antenna using CST Microwave Studio", March 2019, DOI: 10.13140/RG.2.2.12633.57441.

[5] Marranghelli, Ezequiel & Lopez La Valle, Ramon & Roncagliolo, Pedro, "Orthonormal Method for Compact Global Navigation Satellite Systems Antenna Array Designs", International Journal of RF and Microwave Computer-Aided Engineering, December 2019, DOI: 19. 10.1002/mmce.21737.

[6] Sri Jaya Lakshmi, Habibulla Khan, Boddapati Taraka Phani Madhav, "Design and analysis of high gain array antenna for wireless communication Applications", Issue 26, January-June 2015, p. 89-102.

[7] Srija De, Poulami Samaddar, Sushanta Sarkar, Debasree Sarkar, Sushanta Biswas & Partha Pratim Sarkar, "Design of High Gain Microstrip Patch Antenna", Indian Journal of Pure & Applied Physics, Vol.54, September 2016, pp. 562-564.

This page is kept blank intentionally

Low Power Multimedia Processing in WSN

SnehalRaj.S.Verma
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai,India
srsmvraj@gmail.com

Dakshata.R.Rabbi
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai,India
dakshata9766@gmail.com

Sukanya.R.Konar
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai,India
sukanyakonar1347@gmail.com

Abstract— **Recently, the advancements in the field of wireless technologies has led to the development of potential applications in wireless sensor networks (WSNs). The sensors in WSN create a significant impact on various applications such as pattern recognition and image restoration, which generates a massive quantity of multimedia data. Since transmission of images consumes more computational resources, various image compression techniques have been proposed. But, most of the existing image compression techniques are not applicable for sensor nodes due to its limitations on energy, bandwidth, memory, and processing capabilities. This project mainly focuses on overcoming the limitations of WSN, such as power consumption, saving battery life of sensors, and transmission of media in the easy way possible which in turns helps to reduce the traffic of the data transmitted, and making it an easy way to reach its destination. Algorithms such as the Lempel Ziv Markov Chain (LZM) algorithm will be employed for encoding purposes. The NCS (Neighborhood Correlation sequence) algorithm performs the bit reduction operation to further compress the image. The proposed NCS algorithm will increase the compression performance and decrease the energy utilization of the sensor nodes with high fidelity.**

Keywords—Wireless sensor networks, military, high fidelity image processing, source coding.

I. INTRODUCTION

A Wireless Sensor Network (WSN) has become a research topic due to its applications in diverse fields such as agricultural drones, environmental monitoring, wearables, autopilot, smart supply chain, border surveillance, dis-aster management, smart buildings, and smart cities. WSN contains a large number of free, dedicated, compact sensors deployed randomly in the sensing field to monitor the physical phenomenon in the environment. In system architecture of WSN, each sensor node consists of four main components namely sensing unit, a processing unit, communication unit/transceivers, and power supply unit .These image-based applications of WSN face a more significant challenge of energy utilization since high quality images usually require a higher number of bits to represent it. Consequently, the sensor node forwards the packets to BS directly or via multichip and it results in the energy exhaustion quickly than gathering data as well as transmitting scalar data such as temperature and humidity Besides, the nature of the wireless channel has subjected it to high packet losses, and it degrades the image quality to a maximum extent. In this case, the packet loss can be resolved by the use of error resilient techniques, which further increases the energy utilization and delay. To overcome these issues, image compression techniques are employed before transmission to increase the power saving or decrease the energy utilization [5]. It is argued that the increase in the compression performance results in high image transfer rate with reduced energy consumption. Generally speaking, when the compression ratio (CR) of
50% is attained, it is possible that half of the total energy can be preserved or twice the number of images can be communicated with the same amount of resources. Wireless Sensor Networks (WSNs) have a number of limitations related to processing, storage, and Communication capabilities, which severely restrict their adequacy for multimedia sensing and communication. However, issues of power consumption are of fundamental concern in these systems, leading to questions concerning their efficiency and raising the need to design new low power approaches to deliver multimedia content with a certain level of quality of service to the end user [5]. The sensor network has one of the key advantages that they are capable of eliminating the gap between the physical and logical worlds as they gather the information from the physical world and communicate it to the powerful logical devices that are able to effectively process it. This paper focuses mainly on overcoming limitations of WSN (Wireless sensor networks). The main objective of the project is to use images for processing and compression through various techniques and algorithms. After compressing the image, this data will be sent through a wireless sensor network. The power consumption in the transmitting of this data through a WSN will be reduced as compared to other algorithms

II. LITERATURE REVIEW

The approach of employing image sensing to detect an event of interest locally prior to transmission of the Region of Interest (ROI) would avoid useless data transmission. This scheme is based on 2D General Fourier shape descriptors for target recognition and notification to the end user. The Scheme based on the GFD algorithm using Matlab was implemented to establish the efficiency of the selected shape descriptor.

Since, There are two different and useful methods used, this method helps to prolong the life of the network from the end. In Future this work can be improved by working on communication overheads, which would result in clearer concepts of efficiency of this solution, for deployment in WSN. This project can be further upgraded to handle the multiple target detection for simultaneous monitoring [1]. In wireless network the Heterogeneous Networks, where multimedia and non-multimedia nodes deliver data. In this scenario, no multimedia node constraints have to be taken into account to deliver multimedia data through multi-hop paths. Generally, collaborative processing makes no sense in this case. Although in-sensor multimedia processing is a fundamental topic in order to obtain an effective data reduction. Architecture, Node constraints, Compression, Bandwidth, Power, In-network processing support, to efficiently extract relevant information from multimedia data, In-node processing support, to compress data, signal analysis and features extraction, Cross-layer design and New hardware design to better manage the energy with high QoS. It is noted that this work failed to lesser the power consumption of the battery that was used to send the multimedia data across a network after a compression; also the attempt to increase the speed of data transmission failed due to single hop architecture [2],[3]. The Neighborhood Correlation Sequence (NCS) algorithm performs the bit reduction operation and then encoded by a codec (such as PPM, Deflate, and Lempel Ziv Markov chain algorithm) to further compress the image. The proposed NCS algorithm increases the compression performance and decreases the energy utilization of the sensor nodes with high fidelity. The proposed algorithm attains a higher PSNR value of 48.06 on all the applied test images, and it implies that the reconstructed image is identical to the original image. These values verify that the proposed method follows lossless compression and there is no loss of quality in the reconstructed image. It is noted that the proposed algorithm and JPEG compete for each other and showed the closest compression performance. JPEG outperforms the NCS algorithm in most of the test images, the proposed algorithm manages to achieve better results than JPEG on all the applied texture images [4],[5].

III. GAP ANALYSIS

In image processing, since the power consumption is proportional to the number of bits to be transmitted, the amount of data gets increased which impacts on reducing power consumption. To minimize the amount of images transmitted through the WSN, the proposed system will check if the captured image contains information that interests the end user. Then, sending the minimum number of bytes that represents the detected object will contribute to achieve low power consumption. In image compression, since the low cost, low power sensors nodes are operated using inbuilt batteries, they fail to sustain with high level computations involved in the compression process. Therefore, there is a necessity of computational and energy resources of the sensor nodes which leads to the necessity of the design and development of low complex and energy efficient image compression algorithms.

IV. METHODOLOGY

The targeted image is first compressed using a compression algorithm shown in Fig.1. The compressed data is processed in order of a low power scheme to reduce the energy consumption of the whole network. The low power scheme is applied to wireless sensor networks (WSN) to overcome the gaps which are limiting the use of WSN. In NCS (Neighborhood Correlation Sequence) Algorithm, the given image pixels are converted to code word. For every pixel value, two code words are generated based on 0s based and 1s based transversal. Then the code word with a minimal number of bits is chosen as an optimal code word, at the end all the code words are concatenated and the compressed file is generated. This compressed file is further processed and implemented using the Lempel Ziv Markov Chain (LZM) algorithm. The reduced bits processed from NCS algorithm is applied to Delta Encoding process and then further passed to sliding dictionary encoding processing , after that the data the processed bits are the applied to range encoding and this range encoding bits are directly transmitted.[3]

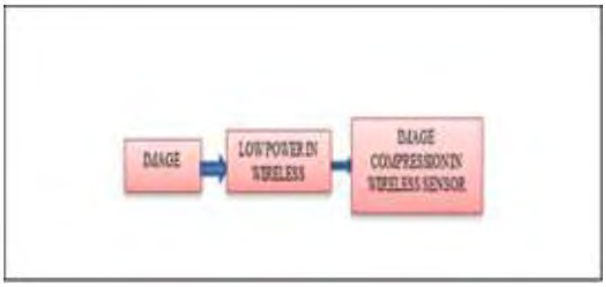


Fig.1. Image Processing in WSN

a. Using the software Python 3.8 version with Jupyter Notebook as the IDE the following was implemented:

1. An image was imported from a file on the desktop.
2. This was done using an open source library i.e. PIL.
3. PIL is the Python Imaging Library which is addressed as Pillow in the newer version, it is used to adds support for opening, manipulating, and saving many different image file formats.
4. The next library used is Matplotlib, which is used to convert an image into numerical mathematics extension Numpy.
5. The next step is to load the image file onto the python compiler by giving a command with the path of the file.
6. Last step is to read and show the image that is obtained.

b. The following steps were followed for transmission of an image from Server to Client. Image was transferred using ―Python 3.8‖ software and also with command prompt.
1. A socket library was imported in (Server and Client). This Library allows the connections between both the ends.
2. The host and port address were given as an input to the server and client, so that it becomes easy for the client to connect to the server.
3. After the connection is achieved, the server sends the image file (jpeg) to the client.
4. The client first asks the location to the server, where the server wants to save its image with its folder name.
5. The server responds to the instructions from the client and gives the folder name accordingly. The folder name is taken as an input to the client.
6. After the location and folder is created the server is now able to transfer the image. Server responds by sending ―Image transferred successfully‖.
7. The image is received at the client side and is stored according to the given location and folder by the server. The client after successfully receiving the image displays ―Image received successfully‖.

V. RESULTS AND DISCUSSION

An image of Flower of 11kb was transmitted to the client through the server. This was implemented using software named ―Python 3.8‖.This software basically gives the freedom to use various open source libraries for the particular task to be done in the project .The two libraries that are used currently to show and read an image is PIL and Matplotlib.
1. The following Fig.2. is about the server side. This snippet is achieved when the server successfully sends an image to the client.

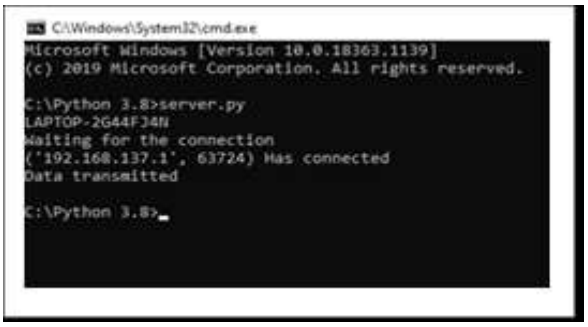


Fig.2. Output of Server Side.

2. Fig.3. Is about how the Client side responds when, transmitted image is received successfully

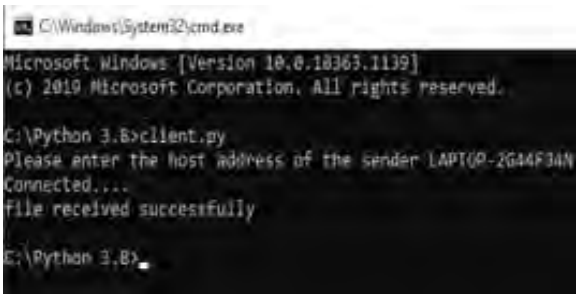


Fig.3. Output of Client Side.

3. Fig.4. The image of Flower which was transmitted through server to client. This image after the reception is stored in a folder.

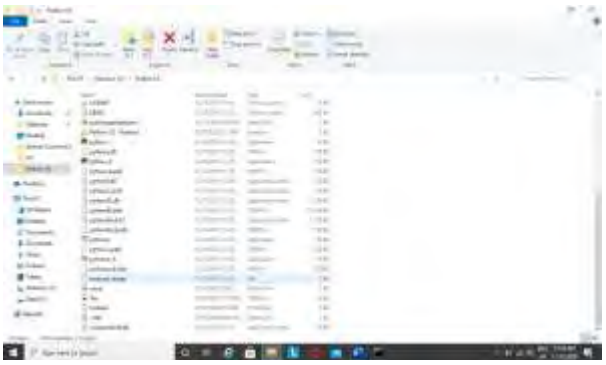


Fig.4. Received image in a folder

4. After the image is received , output reflects as shown in the Fig.5.

Fig.5. Received Image

5. Reading of an image was also obtained which was achieved through Jupyter IDE. Following figure shows the same.

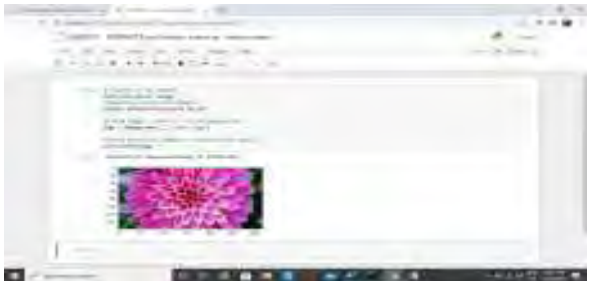


Fig.6. Reading of an Image

VI. CONCLUSION

In Wireless Multimedia Sensor Networks (WSN), Limitations can be overcome by using different compression algorithms and Encoding techniques in order to save the battery life of the whole network. This project will be implemented using NCS (Neighborhood correlation Algorithm) and Lempel Ziv Markov Chain (LZM) for compression purposes, a reliable and low complexity image compression algorithm for WSN.The future scopes will be to ensure the reduction of communication overheads and to ensure the secure data transfer throughout the transmission. The proposed compression scheme can be further enhanced by the use of effective encoding techniques to encode the codewords generated by the NCS algorithm. In addition, it can be implemented on the IoT devices to handle the constrained resources on computer vision based applications.

REFERENCES

[1] N. Lu; J. Wang; Q. Wu; L. Yang. An improved Motion Detection method for real-time Surveillance, IAENG International Journal of Computer Science, 35:1, IJCS_35_1_16, February 2012.J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.

[2] Belongie et al., ―Shape matching and object recognition using shape contexts,‖ IEEE Transactions on Pattern Analysis and Machine

Intelligence, vol. 24, no. 4, pages 509–522, 2002.

[3] J. C. Chan and P. W. Tse, ―A novel, fast, reliable data transmission algorithm for wireless machine health monitoring,‖ IEEE Trans. Rel., vol. 58, no. 2, pp. 295–304, Jun.

[4] C. Pham, ―Communication performances of IEEE 802.15.4 wireless sensor motes for data-intensive applications: A comparison of WaspMote, Arduino MEGA, TelosB, MicaZ and iMote2 for image

surveillance,‖ J. Netw. Comput. Appl., vol. 46, pp. 48–59, 2014.

[5] J. Uthayakumar, T. Vengattaraman, and P. Dhavachelvan, ―A survey on data compression techniques: From the perspective of data quality, coding schemes, data type and applications,‖ J. King Saud Univ. - Comput. Inf.Sci., vol. 32, pp. 1–22, 2018.

Design and Development of Underwater Communication System using IR

Rohit Singh
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
rohitsingh1444@gmail.com

Saumya Jaiswal
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
saumyajaiswal@gmail.com

Nikhil Kesarwani
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
nikhilkesarwani786@gmail.

Abstract —**The system uses the ultra-low power MCU as the control core, and uses the infrared wireless communication, achieving a simple underwater wireless communication. The entire system consists of 3 parts, the land-based unit, the electrical unit and the submarine model. The land-based unit uses the ASK modulation to achieve wireless communication with the submarine model. The submarine model receives and decodes signals, then communicates with model unit via infrared light waves. The motor unit receives the infrared signals and keeps the floating and diving of the submarine model by controlling the suspension. Underwater communications exploit IR frequencies to interconnect microcontroller systems deployed for various scientific, environmental, industrial, or security tasks. The engineering of networked devices in underwater surroundings is nowadays considered a crucial analysis challenge. The propagation of IR signals in water is characterized by low, distance-dependent bandwidth with high latency, and multi-path effects, which build it necessary the look of novel system-level solutions, communication protocols, and algorithms specifically tailored for these sorts of applications**

Keywords— Internet of Things (IOT), water monitoring sensors, fish farming, monitoring water quality

I. INTRODUCTION

Nowadays we need very fast communication system for our daily professionals. We have low timing and fast working for our business areas. Therefore we need a system that allows fast accessing in our daily needs. Wi-Fi is great for general wireless coverage within a building whereas Li-Fi ideal for high density wireless data coverage in bound areas where there are no obstacles and reliving radio frequency interference issues. In similar ways Infrared technology addresses a wide variety of wireless applications. The frequency range of infrared is higher than microwave and lesser than visible light.

Underwater communications exploit IR signals to interconnect microcontroller systems deployed for various scientific, environmental, industrial, or security tasks. The engineering of networked devices in underwater surroundings is nowadays considered a crucial analysis challenge. The propagation of IR signals in water is characterized by low, distance-dependent bandwidth with high latency, and multi- path effects, which build it necessary the look of novel system-level solutions, communication protocols, and

Algorithms specifically tailored for these sorts of applications

II. PROPOSED FRAMEWORK

A. Dataset Used

This technology is still under research and surely it will be a breakthrough in communication. It assures higher data speed for serial communication which is entirely greater than radio waves. In this paper transmission of data is done through this IR sensor technology.

The first type of underwater communication system uses an acoustic Apparatus like sonar that allows for underwater communication over short distances. A problem with this acoustic transmission is that the intelligibility of the transmissions is often low comparably due to the thermocline echoes generated by underwater environments, ambient noise and reverberations

B. Algorithms Used

1. JAVASCRIPT: JavaScript is a scripting or programming language that allows you to implement complex features on web pages every time a web page does more than just sit there and display static information for you to look at JavaScript is a scripting or programming language that allows you to implement complex features on web pages.

2. Visual Studio: Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs, as well as websites, web apps, web services and mobile apps. ... Visual Studio includes a code editor, The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation.

3. EAGLE: EAGLE, an acronym for Easily Applicable Graphical Layout Editor, is a design software by Cadsoft Computers. It is widely used by educationalists, students, hobbyists and professionals because of its rich yet simple interface with large component .

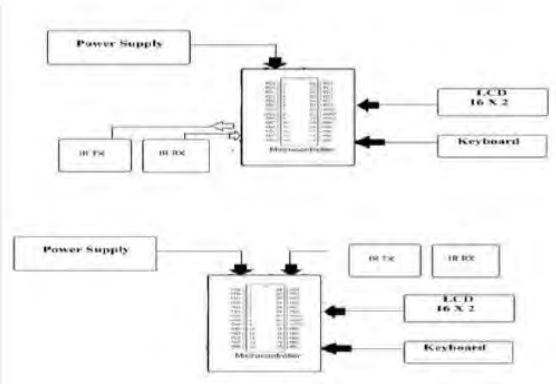
4. PROTETUS: The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for pcb.

III. PROPOSED METHODOLOGY

Here we propose an underwater communications system which consists of two communications modules which transmit and receive data utilizing infrared radiation. Each module has a transmitter/receiver which converts each received data byte formatted data for transmission to a RX.
Each communication module also includes a timer for providing a forty kilohertz pulsed signal to modulation circuitry which passes the pulsed signal through the modulation circuitry when a logic zero is supplied to the modulation circuitry and which inhibits the pulsed signal when a logic one is supplied to the circuitry. That portion of the pulsed signal which passes through the modulation circuitry is provided to a light emitting diode which transmits a pulsed burst of infrared radiation to an infrared light detecting unit within the second communications module.
The infrared light detecting unit then provides a logic zero at its output when it receives a pulsed burst of infrared radiation for time period of approximately six hundred microseconds and a logic one when the unit fails to detect a pulsed burst of infrared radiation for a time period of six hundred microseconds.

IV. BLOCK DIAGRAM

The designing of the block diagram plays a very important role as it visually describes the system as a whole displaying the significant elements of the system. The diagram below is the block diagram of the project



The above block diagram shows that the input is given to the integrated circuit to right and then moving down to the next line. This is the author sequence that will be used in future citations and by indexing services. Names should not be listed in columns nor group by affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization).

V. LITERATURE SURVEY

1. Two way communication using IR sensors with Arduino by using Li-Fi principle:

This research paper was published by Vladimir kirskovkev of Russia in 2018 in this they used for li fi principle. It is unclear how successful the same Method would be for different chort . It is also very costly.
2. High bandwidth underwater data communication system

It was published by lacovara in 2019 by Joseph physics. In this the technology used in leds are used and orlgan laser sare transmitters for communication .the receiver uses automatic gain control to facilitate performance of the apparatus over a wide range of distance and water r turbidities
3. Method and underwater bases for using autonomous underwater vehicle for marine sesmic surveys:

It was published by cgg services sa in 2015 .the Technology used in this seismic sensors for recording seismic signals during machine seismic survey. The technology used is it so it will be less costly and environment friendly

V. FLOWCHART

A. Transmission part

In transmitter part the data is said to be transmitted by transmitting a number or word from pc via data modulation unit and through led array. Words/data can be converted to digital signals of 0s and 1s in data modulation unit and provides series of pulses such that data can be converted into digital signals of binary bits. Data gets selected from the pc which we want and is then transmitted successfully. Once the data is transmitted it reaches receiver side through IR LED. The goal of transmitter part is to transmit data.

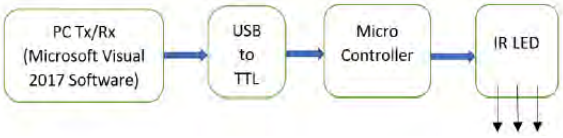


Fig. 6.1 Data Modulation & Transmission

B. Receiver part

The goal of receiving part is to receive the data that is transmitted from the transmitted side successfully. The data sent by transmitter is successfully received by the receiver that is IR photo detector is detecting the invisible rays coming from the IR LED.

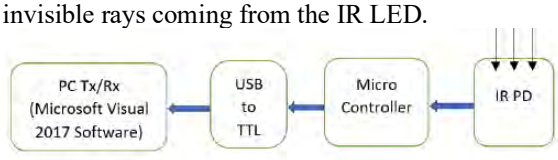


Fig. 6.2 Demodulation & Decoding of Data

VI. APPLICATIONS

• In the coming days, the applications could increase from myriad industries ranging from the offshore oil company to aquaculture and fishing industries.
• It can also be used in pollution control and climate recording.
• It also has the application in the detection of the objects on the ocean floor.
• Underwater communication can also be used in environmental monitoring and collecting of oceanographic information.
• It has the application in marine archaeology, search and rescue machines and defense.
• It can also be used in seismic monitoring, pollution monitoring and ocean currents monitoring.
• The underwater communication system can be used in the equipment monitoring and control and also in the autonomous underwater vehicles (AUV).
• It can be used in remotely operated vehicles (ROV).
• It can be used in solar-powered autonomous underwater vehicles

VII. FUTURE SCOPE

It assures higher data speed for serial communication which is entirely greater than radio waves. In this Paper transmission of data is done through this IR sensor Technology. The goal of this paper is our project provides Secured, low cost, easy data transmission and provides Reliable communication. It can use in a whole building for office management. It can also be used in industrial, Medical, military applications. This is still in its beginning Stages, but improvements are being made rapidly, and soon this technology will be able to be used in our daily lives. Despite much development in this area of the underwater Wireless communication, there is still an immense scope more research as major part of the ocean bottom yet remains Unexploded. The main objective is to overcome the present Limitations and implement advanced technology for. Oceanographic research and cope up with the environmental effects & the noise disturbance to compete with the future Challenges like effective transmission of audio and video signals etc.

VIII. CONCLUSION

From the above study it is clear that it will help in increasing The communication between two people with greater Efficiency and more speed.It will ensure that communication is not over reched and not Tampered and listen by somebody else.A safer and faster way of communication.

ACKNOWLEDGMENTS

This project cannot be entirely created by an individual. The timely completion of the project ‘Design & Development of Underwater Communication System using IR’ has been possible because of our teacher and project guide Ms. Poorva Waingankar who provided us with guidance and motivation throughout its making. We thank her for giving us an opportunity to create this project.
We are also thankful to Dr. S.C. Patil (Electronics Department, HOD) for his guidance and to our parents for providing all possible resources to gain the best possible knowledge.
Finally, we would thank our college ‘Thakur College of Engineering and Technology’ for providing us with a platform and the necessary facilities to make this project

REFERENCES

[1] Sapna Mamidkar, Rahul Verma “Two Way Communication Using IR Sensors with Arduino by Using Li-Fi Principle” ISSN: 2319-7064 Paper ID: ART20202879 DOI: 10.21275/ART20202879

[2] Mahendran R., 2016, May. Integrated Li-Fi (Light Fidelity) for smart communication through illumination. In Advanced Communication Control and Computing Technologies (ICACCCT), 2016 International Conference on (pp. 53-56). IEEE. He presented the methodology of sending image from one system to another using Li-Fi technology

[3] Riccardo Scopigno, Senior Member IEEE, Alessia Autolitano, Tankut AcarmaDzn2, <;:agda Yaman, and Suat Topsu,”The Potential Benefits of On-Board Li-Fi for the Cooperation among Vehicles”, International conference on Transparent optical Networks – 2015.

[4] Philip Lacovara, Tucson, AZ (US) “HIGH – BANDWIDTH UNDERWATER DATA COMMUNICATION SYSTEM” Patent No. : US 10,263,711 B2 ,Date of Patent : Apr . 16, 2019

[5] Antoine LELAURIN, Paris (FR), Thierry BRIZARD, METHODS AND UNDERWATER BASES FOR USING AUTONOMOUS UNDERWATER VEHICLE FOR MARINE SESMIC SURVEY

This page is kept blank intentionally

LIDAR Based Self-Driving Car with Solar Charging Capability

Anish Rao Somawar
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101

Armaan Chaudhary
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101

Shadan Khan
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101

***Abstract*— Self-driving cars is the hottest topic in the automobile industry. The need to sense the surroundings of every autonomous vehicle has pushed forward a race dedicated to deciding the final solution to be implemented. However, the diversity of state-of-the-art approaches to the solution brings a large uncertainty on the decision of the dominant final solution. Within this project we intend to overcome the situations of self-driving cars by proposing lidar imaging systems. Using lidar is much cheaper and has its own advantages as it is very precise, has a great response time and is much cheaper as compared. With this project we also intend to use solar energy as the mode of energy as this is an environmentally friendly and sustainable source of energy this makes this project worth working on. There are a lot of drawbacks yet faced in this like the spatial resolution, sensor distribution, etc. We have been working on these drawbacks and if these drawbacks are eliminated then this will make this technology the future of self-driving cars. But this tech still needs a lot of work to be done before it can enter the implementation stage in the real world .**

Keywords— lidar, autonomous, vehicle

I. INTRODUCTION

Increasing population is the major issue of transportation nowadays. So, here we have developed an automated driving system which drives the car automatically. Our goal is to help prevent traffic accidents and save people's time by fundamentally changing car use. We have developed a technology for cars that drives it automatically. We have designed an automated vehicle that is focused to give automated driving experience to the human driver. This car is capable of sensing the surroundings, navigating and fulfilling the human transportation capabilities without any human input. Lidar is used for sensing the surroundings. It continuously tracks the surrounding and if any obstacle is detected vehicle senses and moves around and avoids the obstacle. The advantages of an autonomous car are fewer traffic collisions, increased reliability, increased roadway capacity, reduced traffic congestion. We believe that the autonomous car is a reality and a necessity of life. By overcoming the current obstacles, as human life has to be secured and safe, efficient, cost-effective and comfortable means of transport

II. PROPOSED FRAMEWORK

The following set of Sensors/Microprocessors which are used in the system design are listed as follows:

1. LIDAR
2. Servo Motor
3. Atmega328p (microcontroller)
4. Motor driver

A. Lidar, which stands for Light Detection and Ranging, is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth.

Fig 1 LIDAR sensor

B. A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration.

Fig.2 Servo Motor

C. A microcontroller is a small computer on a single metal-oxide-semiconductor integrated circuit chip.

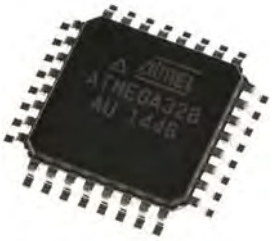


Fig3 Atmega328p (microcontroller)

D. A motor controller is a device or group of devices that can coordinate in a predetermined manner the performance of an electric motor

III. Proposed Architecture & Methodology

In this project, Power supply is the input to the rectifier where the conversion from AC to DC will take place. Regulator will regulate the amount of power required by the system and its input will be given to the microcontroller. Next, the microcontroller is connected to the servo motor which is responsible for the movement of the car. Its input is also given to the motor driver which will have basic forward and basic controls. Finally, LIDAR signal is also fed to the microcontroller for continuous improvement in driving. The block diagram of the working of this entire process is explained as follows

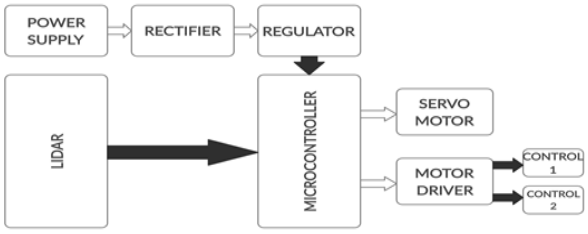
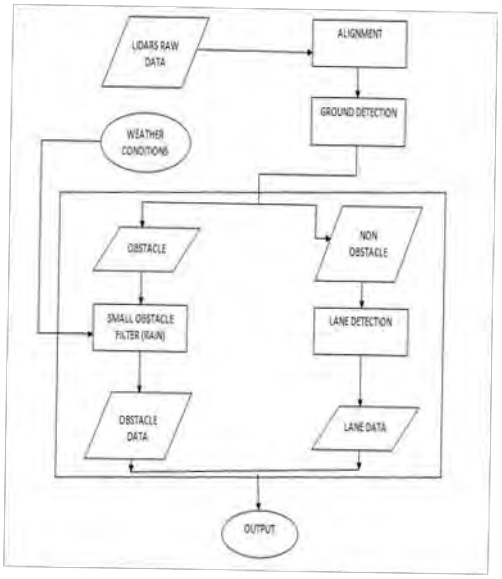


Fig. 5 Block Diagram of Implementation of Lidar based car

Spatial resolution - Dense point clouds with a large spatial resolution both in the horizontal and vertical directions are one of the cornerstones of object detection. While directivity at long range has been achieved even for objects with low reflectivity, the reliable identification of objects at significant distances needs enhancement, as shown by the trend in larger and larger spatial resolution. Sensor distribution - If the components of the sensor suite are still under definition and in an early stage within the production cycle for manufacturing, its potential distribution along the vehicle is not a simple decision to take. The number of sensors reasonably mounted on the self-driving car is estimated to be somewhere between 20 and 40 Bad weather conditions - Autonomous driving tests are, up to now, handled mostly in sunny environments, such as California or Texas. However, the quality of the detection under fog, rain and snow, especially if they are extreme, becomes severely degraded, especially regarding range due to the absorption and scattering events induced by water droplets. This introduces a large number of false detection alarms from the backscattered intensity, reducing the reliability of the sensor

Flowchart



IV. LITERATURE SURVEY

Statistics obtained from the survey are summarized as follows:

1. Embedded system is one kind of a computer system mainly designed to perform several tasks like to access, process, and store and also control the data in various electronics-based systems. Embedded systems are a combination of hardware and software where software is usually known as firmware that is embedded into the hardware. Unlike the camera-based system, Leeder is only functional for short ranges or distances and with certain materials.[1]

2. Self-driven vehicles have many type of algorithms which simulate the driving behaviour in the real world majorly in autonomous miniature vehicles. In the last decade, several approaches have been proposed for obstacle avoidance in self-driving vehicles. We need to work on making unique signals for every car so that the signal of one vehicle does not clash with the other one.[2]

3. The circuit to be implemented will deliver the highest power supply between the 2 to the next part of the circuit; its second function is to provide a suitable charging voltage to a nine we rechargeable battery and supply level of charging current so the proposed design limits the current at a high level. Physical implementation of a solar charger-based PV energy system for charging of cellular and rechargeable batteries .[3]

V. APPLICATIONS

1. TIA

In LIDAR applications, the Trans impedance amplifier (TIA) with its unique bandwidth and noise specifications is central to the signal chain, enabling accurate detection of fixed or moving objects. An effective TIA must have wide enough bandwidth to capture all of the details in different road conditions, with noise that is as low as possible to avoid distorting the signal that's being received.[4]

2. Conscious driving

The technology fusion of cameras, radar, and LIDAR systems creates a near-human vision system for the autonomous car. Although these three sensors provide differing data and information, the computing power of the autonomous car fuses the three perspectives together. Special focus on the optical front-end operation in this article shows how LIDAR is a strong player in the trio. The LIDAR-ready TIA and comparator highlighted provide unprecedented levels of system accuracy. And with this accuracy should come greater confidence in the capabilities of the self-driving cars that may soon make your commute a more productive or relaxing one.

3. Radar mapping

Radar sensors supplement low-visibility cameras. Radar has been around since the beginning of time for aircraft, weather formations, and detecting ships. The technology transmits radio waves in pulses. Once the waves hit an object, they bounce and return to the receiver. This provides speed and location object data. Radar sensors also surround the car, detecting objects at every angle. While this sensor technology determines speed and distance, it can't distinguish between different vehicle types. Together, the radar and camera sensors provide data that is sufficient for lower levels of autonomy, but they don't cover all situations and fall short of the human experience.

VI. RESULTS

With the implementation of the system described in this paper, the aim is to allow autonomous vehicles to travel smoothly and avoid collisions by detecting the obstructions ahead. This improves the safety of the commuters and makes autonomous cars less prone to accidents because the risk of human negligence and rash driving is absent.

VII. FUTURE SCOPE

Autonomous vehicles will not completely replace human drivers in the foreseeable future. However, they are likely to have a large impact in specific areas, such as urban ridesharing and long-haul freight transportation. An analogy is that ridesharing companies such as Uber have had a huge impact on many people's lives, even though they have come nowhere near completely replacing car ownership. We will see a similar scenario with self-driving cars. Many people will see their lives transformed, but human drivers will still remain on the roads for a long time. Everybody is moving very fast in this industry. Automotive and technology companies realize how transformative self-driving cars will be, and they are racing to capture that market. Some companies are working toward a driverless vehicle that will be owned by consumers. This means that the vehicle needs to be able to go anywhere, just like any car on the market today can go anywhere. Probably there will be some places, maybe highways, where the vehicle will be able to drive itself, and other places, maybe rural roads, where a human needs to possible knowledge. Finally, we would thank our college 'Thakur College of Engineering and Technology' for providing us with a platform and the necessary facilities to make this project

ACKNOWLEDGMENT

This project cannot be entirely created by an individual. The timely completion of the project 'LIDAR based self-driving car with solar charging capability' has been possible because of our teacher and project guide Mr. Sumit Kumar (Electronics Department,) who provided us with guidance and motivation throughout its making. We thank him for giving us an opportunity to create this project. We are also thankful to our parents for providing all possible resources to gain the best possible knowledge. Finally, we would thank our college 'Thakur College of Engineering and Technology' for providing us with a platform and the necessary facilities to make this project.

REFERENCES

[1] Xinwei Fang;Kourosh Khoshelham;Sander Oude Elberink;Detection of Cars in Mobile Lidar Point Clouds(2018);3rd IEEE International Conference on Intelligent Transportation Engineering (ICITE)

[2] Chan Wei Hsu;Tsung Hua Hsu;Kuang Jen Chang;Implementation of car-following system using LiDAR detection (2012);12th International Conference on ITS Telecommunications

[3] santiago royo;Lidar imaging system for autonomous vehicles(2019)

[4] Khadija EL, Kamouny, Brahim Lakssir; Solar Charger Sizing (2015)

This page is kept blank intentionally

Indoor Tracking Using Beacon

Girik Tripathi
Electronics and Telecommunication
Thakur College Of Engineering & Technology
Mumbai, India
giriktripathi1@gmail.com

Raunak singh Matharu
Electronics and Telecommunication
Thakur College Of Engineering & Technology
Mumbai, India
raunaksinghmatharu@gmail.com

Rachit Shah
Electronics and Telecommunication
Thakur College Of Engineering & Technology
Mumbai, India
shahrachit42@yahoo.com

***Abstract* — Bluetooth Low-Energy (BLE) beacons-based indoor positioning is a promising methodfor indoor positioning, especially in applications of position-based services (PbS). It has low deployment cost and it is suitable for a wide range of mobile devices. Existing BLE beacon-based positioning methods can be categorized as range-based methods and fingerprinting-based methods. For range-based methods, the positions of the beacons should be known before positioning. For fingerprinting-based methods, a pre-requisite is the reference fingerprinting map (RFM). Many existing methods focus on how to perform the positioning assuming the beacon positions or RFM are known. However, in practical applications, determining the beacon positions or RFM in the indoor environment is normally a difficult task. This paper proposed an efficient and graph optimization-based way for estimating the beacon positions and the RFM, which combines the range-based method and the fingerprinting-based method. The method exists without need for any dedicated surveying instruments. A user equipped with a BLE-enabled mobile device walks in the region collecting inertial readings and BLE received signal strength indication (RSSI) readings.**

I. INTRODUCTION

BLE Beacon stands for Bluetooth Low Energy Beacon. Often used for asset tracking and indoor positioning, the beacons can communicate with receivers and the user through Bluetooth. The system designed utilizes BLE beacons to primarily measure Random Signal Strength (RSSI) values of the beacon with respect to the receiver. These values can further be used to calculate the approximate distance of the beacon from the receiver.
.

II. LITERATURE SURVEY

The major elements involved in the system are the localization server, service-provision client, user application positioning technology.[1]
An accuracy of result gets worse when a lot of pedestrians pass through in front of installed beacons. They proposed dynamical and optimal beacon selection method to minimize affections of wireless signal shielding by the movable obstructions.[2]
The present invention in a preferred embodiment provides a system for finding the indoor position of the asset using an array of receivers. The BLE beacon attached with the asset is tracked with 3 receivers and therefore it's RSSI values are obtained. Further the values are processed and the position of beacon is displayed.[3]
While beacon mobility scheduling is long considered a great difficulty in mobile beacon assisted sensor localization, In this paper it is shown that it can be surprisingly accomplished by using the sensor network as a navigation graph . This solution guarantees full localization when each beacon is able to measure pair wise distance accurately even when measurement noise is present.[4]
The proposed system works in two phases; offline and online phase. The offline phase involves creating a radio map. The radio map, will stores distributions of RSS values from all detected APs at specific points which are known as marking
positions. The marking positions together will the MAC address of each detected APs and their corresponding RSS values will be stored in the database to create the radio map.[5]

III. METHODOLOGY

For flow of execution we may require different things such as Beacon. Beacon is a Bluetooth device with less power It is used to detect the position at a particular instance.

Fig 1

Raspberry pi: Executes the program written with the Python language. The server updates the indoor map by acquiring the RSSI values1 from the user application and provides the map to the service client.

Android smart device: User application acquires the RSSI values every 0.546 s by scanning the signals from the location beacons and transmits them to the server

IV. RESULT

An accuracy of results gets worse when a lot of pedestrians pass through in front of installed beacons. Beacon will be able to detect the movable obstructions in real time using video camera that installed in the area.

We can make the map in different colour to indicate if the area is restricted or not.

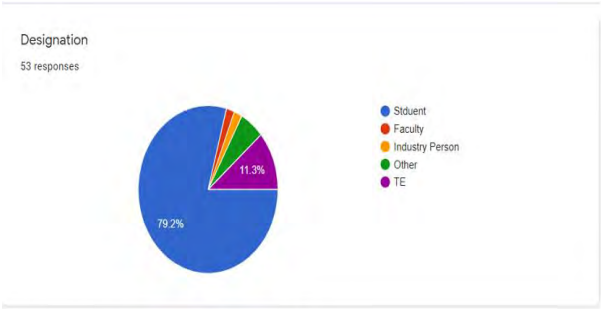
By this project we will be able to locate aur location and would be able to find our path to the destination

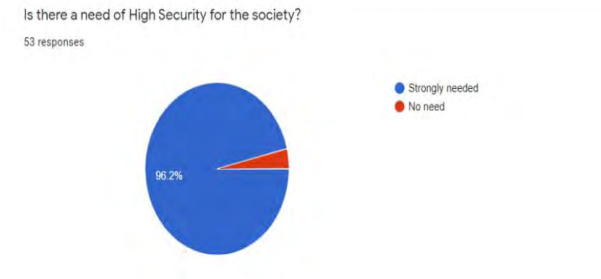
V. CONCLUSION AND FUTURE SCOPE

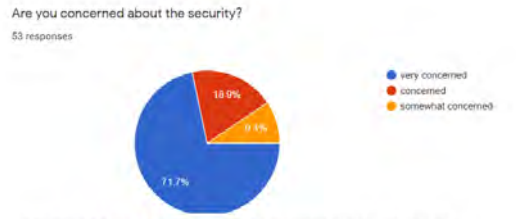
An accuracy of results gets worse when a lot of pedestrians pass through in front of installed beacons. Beacon will be able to detect the movable obstructions in real time using video camera that installed in the area. We can make the map in different color to indicate if the area is restricted or not. By this project we will be able to locate our location and would be able to find our path to the destination.

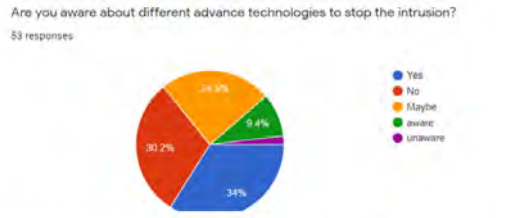
VI. SURVEY

The following survey was conducted for our project:









REFERENCES

[1] Unni. R, Pati U.C, “PC based ultrasonic Intrusion Detection System”, International Conference on Communication and Signal Processing, April 3-5, 2018.

[2] Rutvik Kakadiya, Reuel Lemos, Sebin Mangalan, Meghna Pillai, “AI Based Automatic Robbery/Theft Detection using Smart Surveillance in Banks”. Third International Conference on Electronics Communication and Aerospace Technology [ICECA 2019]

[3] Ashutosh Gupta, Yogesh Kumar, Sanal Malhotra,"Banking Security System using Hand Gesture Recongnition", International Conference on Recent Developments in Control, Automation and Power Engineering (RDCAPE), 2015.

[4] Kande Archana, Dr.P. Bhaskara Reddy, Dr. a. Govardhan, “To Enhance the Security for ATM with the help of Sensor and Controllers”, International Conference on Energy, Communications, Data Analytics and Soft Computing, 2017.

[5] Sonam Biswas, Abhishek Roy, “An Intrusion Detection System Based Secured Electronic Service Delivery Model”, Third International Conference on Electronics Communication and Aerospace Technology [ICECA 2019]

[6] Jacintha .V, J. Nagaranjan, K. Thanga Yogesh, Tamilarasu. S, S.Yuvaraj, “An IOT based ATM Surveillance System”. International Conference on Computational intelligence and Computing Research. 2017.

[7] Sambarta Ray, Souvik Das ,Dr. Anindya Sen, “An Intelligent Vision System for monitoring Security and Surveillance of ATM”, IEEE INDICON 2015.

[8] Xiaojing Yuan,Zehang Sun,Yaakov Varol and George Bebis, “A Distributed Surveillance System”,IEEE Conference on Advanced Video and Signal Based Surveillance,2013.

Bank Locker Intrusion Detection and Alert System

Anupama Hasurkar
Electronics and Telecommunication
Thakur College of Engineering & Technology
Mumbai, India
anupamahasurkar@gmail.com

Abhishek Dubey
Electronics and Telecommunication
Thakur College of Engineering & Technology
Mumbai, India
abhishek09dubey85@gmail.com

Ankita Saha
Electronics and Telecommunication
Thakur College of Engineering & Technology
Mumbai, India
ankitasaha34@gmail.com

***Abstract*— This paper presents an IoT based security system with auto arrest. Day by day with increasing customers bank has to face many challenges and protecting the resources using a very efficient and smart security system is required. Our system only monitors the area when motion is detected by the various sensors which are kept at different sections in the bank and if there is any possibility of any suspicious activity, our system also has the provision of auto arresting which is implemented using the relay system.**

Keywords—burglar alarm, IoT based system, intrusion detection system, microcontroller, relay system

I. INTRODUCTION

Bank is an institute where we keep our money and other valuables. Where there is money there are thief. Now days there are more cases of burglary so securing bank has become very important and has become the issue of concern over the decade. Nowadays intrusion has become very smart and so does our technology has become advance. This advancement in technology can be the barrier to the intrusions and to avoid such threats. The banking industry is continuing to grow and their technology implementation is forever expanding due to the number of customers that they receive and new challenges they have to face periodically. Security is also necessary for protecting banks from fire and other abnormal activities. With growing development in electronics security system today all manual locks are replaced by electronic gadgets with highly smart technology.

The main aim of our research is to design a system for alerting theft and to auto arrest the thief in bank or ATM itself with the help of a centralized monitoring system. IOT has emerged the idea of controlling devices using internet. For enhancing the security of bank this framework is maintained by central processing unit.

II. LITERATURE SURVEY

In this paper authors have proposed that HC-SR04 ultrasonic sensor is used to detect the range of intruders. After the detection of intruder USB camera will be turned on followed by a primary alert. Human detection algorithm using MATLAB will detect intruder morphology [1]. In this paper authors have used image processing to detect theft and motion of thieves in CCTV footage, without the use of sensors.

It includes real-time analysis of the movement of any human from CCTV footage [2]. In this author have proposed use of hand gesture analysis for human-security system interaction. Hand gesture recognition consisted of five processes such as image acquisition, skin color information for recognizing hand gesture which is obtained from the arm region of the hand, background removal, canny edge detection and contour detection. This research has evaluated an improved hand gesture recognition using web camera and successfully implemented a prototype for security in bank from robbery which is having a detection accuracy rate of 95.7%. [3]. In this paper authors have used PIR sensor PIR to observe the human motion, based on that alarm is produced beep sound from ATM machine. This system uses ARM controller based on embedded system to process real time data collected using the PIR sensor. After alarm, the DC motor will close the ATM door and then the gas will be leaked to make thief unconscious. Using camera surveillance, the recorded footage will be used to make auto arrest [4]. Proposing a single window-based cloud service delivery model, where a smart card serves as a single interface to access multifaceted electronic services like banking, healthcare, employment, etc. To detect and prevent unauthorized access, in this paper, authors have focused on the intrusion detection system of the cloud service model during cloud banking transaction [5].

III. METHODOLOGY

The block diagram (Fig 1) shows our proposed methodology. In our proposed research we use Microcontrollers with different sensors (PIR, Smoke or Fire, IR and Gas) as observatory to detect or identify intruder or abnormal activities inside the bank and ATM. A PIR sensor measures infrared light emitted from objects that generate heat, and therefore infrared radiation, in its field of view and therefore detecting any kind of motion. An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. Active IR sensors have two parts: a light emitting diode (LED) and a receiver. When an object comes close to the sensor, the infrared light from the LED reflects off of the object and is detected by the receiver. Active IR sensors act as proximity sensors.

Gas sensors (also known as gas detectors) are electronic devices that detect and identify different types of gasses. They are commonly used to detect toxic or explosive gasses and measure gas concentration. A fire detector works by detecting smoke and/or heat. These devices respond to the presence of smoke or extremely high temperatures that are present with a fire and after the device has been activated, it will send a signal to the alarm system to perform the programmed response for that zone.

Assume if the bank was locked and a thief enters the bank then this framework will give caution through burglary action. When there is any activity or movement around the locker area the PIR sensor will detect it, the IR sensor will give exact location of the thief. All these data are sent to the microcontroller. Microcontroller is a computational circuit which then processes the data inside it. The microcontroller sends the flag to the central processing unit of this suspicious activity. While in central processing unit all the actions are monitored by the executives and information will be passed to the bank managers and local police stations After that if the theft was confirmed by the executives by checking the values of several sensor inputs, they activate the relay system which in turn activates the auto arresting system and the burglar alarm. Therefore, we can catch the thief easily inside the bank only, therefor keeping the bank secure with the help of latest technology.

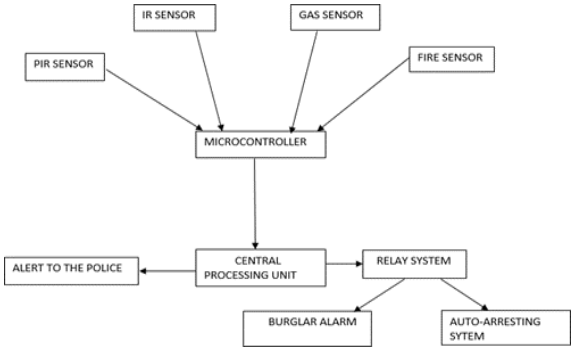


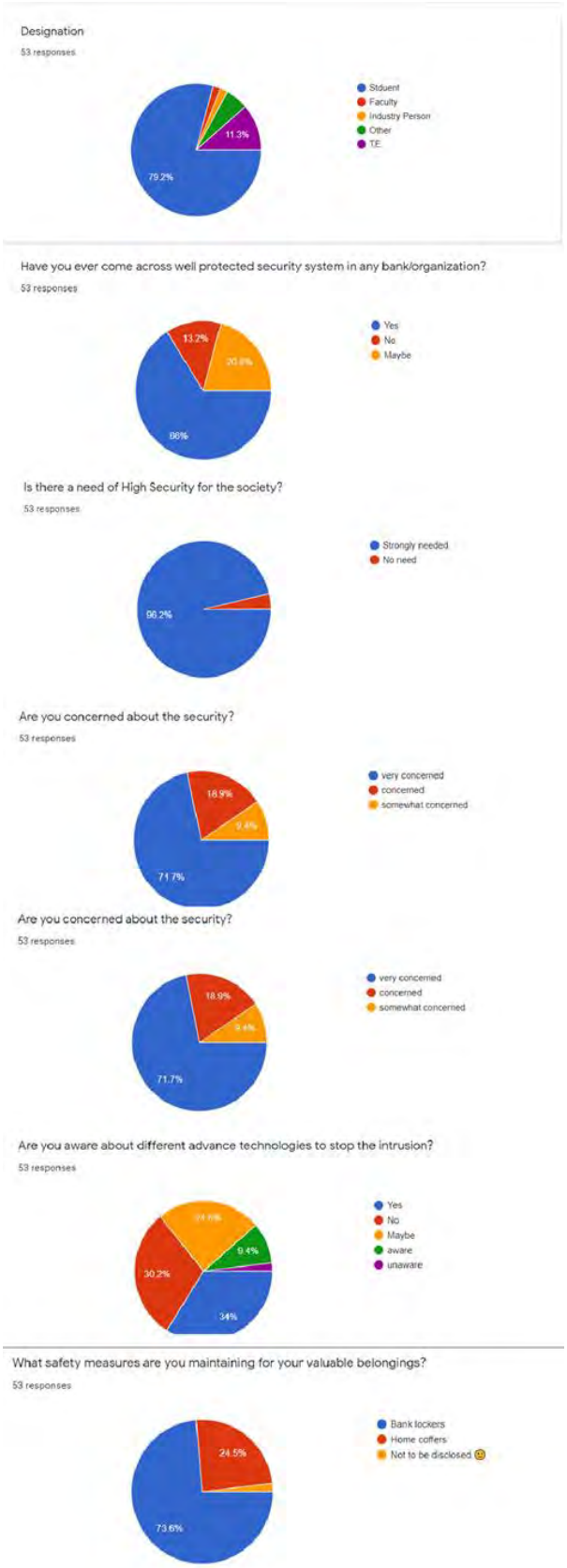
Fig 1: Block Diagram Of system

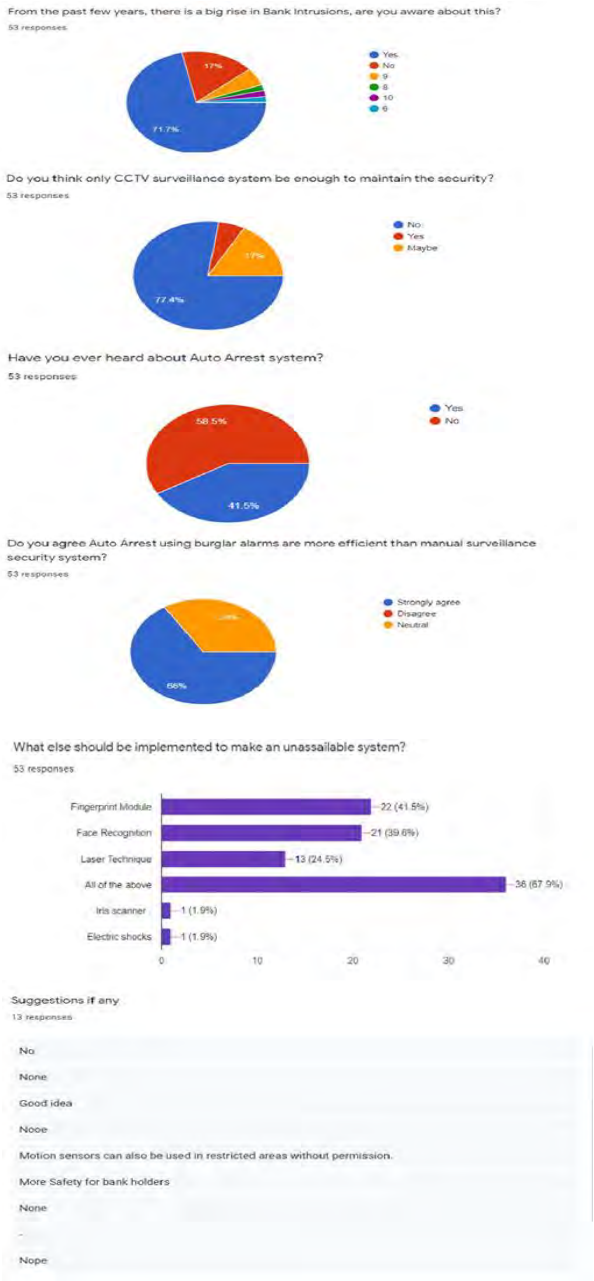
IV. RESULT

With this proposed system, we will replace the existing systems which are not able to provide a high and efficient security to the banks and are not able take quick measures even if a bank intrusion occurs.
Our system works on IoT technology with a central processing unit which will alert the police when there is any suspicious activity and will also auto arrest the thief which will not allow him to run away and will allow the police to reach on time.

PIR sensor is fixed in various part of bank and IR sensor is fixed in the entrance of every room. Fire and Gas sensor will be fixed in the locker area where all the doors are connected with magnetic locks controlled by relay and burglar alarm connected with the relay circuit.

In this proposed work, the PIR and IR sensors will do their work accurately with no time delay with the microcontroller, if the signal is valid then microcontroller display the information about the intruder inside the bank to the central processing center. Then the intruder will be arrested with auto arrest system and information will be sent to the Police and bank manager through the central processing centers.





V CONLUSION

This project is based on smart and centralized monitoring and control system using IOT technologies. It will be very useful to prevent bank intrusion or robbery cases before it takes place. The intruder or the thief will be auto arrested there itself inside the bank. It offers security with the latest technology. It is low cost and compact in size. There is no need to monitor continuously and less human are involved in the monitoring section. It is also useful for taking quick measures in case of any fire inside the bank.

REFERENCES

[1] Unni. R, Pati U.C, "PC based ultrasonic Intrusion Detection System", International Conference on Communication and Signal Processing, April 3-5, 2018.

[2] Rutvik Kakadiya, Reuel Lemos, Sebin Mangalan, Meghna Pillai, "AI Based Automatic Robbery/Theft Detection using Smart Surveillance in Banks". Third International Conference on Electronics Communication and Aerospace Technology [ICECA 2019]

[3] Ashutosh Gupta, Yogesh Kumar, Sanal Malhotra,"Banking Security System using Hand Gesture Recongnition", International Conference on Recent Developments in Control, Automation and Power Engineering (RDCAPE), 2015.

[4] Kande Archana, Dr.P. Bhaskara Reddy, Dr. a. Govardhan, "To Enhance the Security for ATM with the help of Sensor and Controllers", International Conference on Energy, Communications, Data Analytics and Soft Computing, 2017.

[5] Sonam Biswas, Abhishek Roy, "An Intrusion Detection System Based Secured Electronic Service Delivery Model", Third International Conference on Electronics Communication and Aerospace Technology [ICECA 2019]

This page is kept blank intentionally

Performance Analysis of MRC and ZF Receivers in Massive MIMO Systems

Santoshkumar Sabat
Thakur College of Engineering and Technology, Mumbai, Maharashtra, India
sssabat87@gmail.com

***Abstract* — In modern wireless communication, the multiple-input and multiple-output (MIMO) antenna systems give the advantage of spatial multiplexing and diversity gain. Massive MIMO systems have antenna arrays at the transmitter and receiver, enhancing the system capacity manifold and reducing overall system power requirements. In this paper, the analysis of a massive MIMO system's rate performance versus the number of base station antennas is discussed. Here, the performance comparison of linear receivers like Maximum Ratio Combining (MRC) and Zero-Forcing (ZF) is reported.**

Keywords* — *Maximum-ratio-combining (MRC) receivers, Signal-to-Interference-plus-Noise Ratio (SINR), Zero-Forcing (ZF) receivers.

I. INTRODUCTION

In a multiple-input and multiple-output (MIMO) system, multiple users access a network simultaneously. In a point-to-point MIMO system, the array of antennas is placed on the transmitter and receiver sides. Whereas, in Multi-User MIMO (MU-MIMO) system, multiple users, each having a single antenna or multiple antennas, all at once communicates with a multi-antenna base station (BS) [1]. Even if MU-MIMO systems can cater to various users, there are still some implementation drawbacks; the BS needs to have excellent insight into the uplink and downlink channel, which is complicated [2]. Large-scale MU-MIMO systems, popularly called massive MIMO systems, are an exclusive type of MU-MIMO in which the number of users and BS antennas is enormous. Usually, several hundreds of BS antennas cater to tens of single-antenna users [3]. Due to large antenna arrays, traditional signal processing techniques such as ML detection become highly complex. However, it has been shown that when the number of BS antennas is vast compared to the number of active users, simple linear processing techniques achieve nearly optimal results [4]. The impact of small-scale fading can be averaged out if the number of BS antennas is much greater than the number of users [5]. Using basic linear signal processing techniques, like maximum-ratio combining (MRC) in the uplink, the fast-fading effects and the interference from within the cell get suppressed [6]. Massive MIMO system turns out to be the best choice for future wireless generations due to its less complexity than MU-MIMO and having the same advantages as MU-MIMO [7].

Linear detectors like MRC and zero-forcing (ZF) can achieve nearly optimal results in massive MIMO systems [4]. In MRC, the received signal power is maximized while neglecting other users' interference and thus is more suitable for lower transmission powers. In contrast, ZF receivers suppress the other users' interference while bypassing noise and therefore are ideal for high power transmissions. The ZF receivers require computation of the channel matrix's pseudo-inverse, making them more complicated than MRC receivers. However, ZF receivers' performance will severely degrade for poor channel conditions [8].

In comparison, MRC receivers use less complicated algorithms, but they give poor results in case of interference. Nevertheless, suppose the number of BS antennas is higher than the number of users. In that case, even using MRC, the interference can be suppressed. Thus, the best choice is to use an MRC detector with lower transmission powers. Using MRC receiver, the authors in [9] derived the lower bound for massive MIMO systems' capacity. In [10], the authors reported the BER performance of MRC receivers for the massive MIMO system.

In this article, MRC and ZF receivers' rate performance is compared for a Massive MIMO system with power scaling and without power scaling.

PAPER ORGANIZATION

The remaining part of this article is arranged as follows: Section II presents the system model. Section III covers the expression of the SINR for MRC and ZF detectors. In Section IV, the numerical results are provided, and section V concludes the paper.

II. SYSTEM MODEL

Figure 1 shows the system model for a massive MIMO system comprising one BS having M antennas and K users with single-antenna. This article only deals with the uplink transmission where users send their data simultaneously towards the BS. The BS antennas (M) receive the signal.

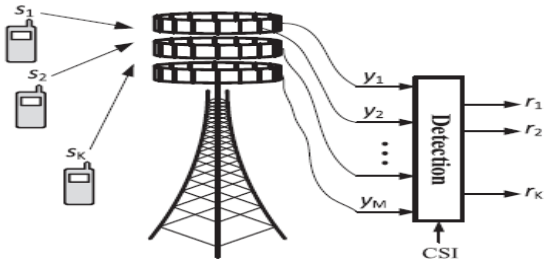


Fig. 1 System model [11]

Let g_k denote the random channel vector between the kth user and the base station.

$$g_k = \begin{bmatrix} g_{1k} \\ g_{2k} \\ . \\ . \\ g_{mk} \\ . \\ . \\ g_{MK} \end{bmatrix}$$

where, g_{mk} is the channel between the mth antenna of the base station and k^{th} user. The average power of the channel can be written as

$$E\{|g_{mk}|^2\} = \beta_k$$

where, β_k is the large-scale fading factor which models the geometric attenuation and shadow fading.

Thus, the $M \times 1$ received vector y at the base station can be written as

$$y = \sqrt{p_u}\ [g_1\ g_2\ \ \ldots\ \ g_K] \begin{bmatrix} x_1 \\ x_2 \\ .. \\ .. \\ x_K \end{bmatrix} + \begin{bmatrix} n_1 \\ n_2 \\ .. \\ .. \\ n_M \end{bmatrix}$$

(1)

Where, $[g_1\ g_2\ \ \ldots\ \ g_K]$ is the channel vector of $M \times K$ matrix, can be denoted as G, $\begin{bmatrix} x_1 \\ x_2 \\ .. \\ .. \\ x_K \end{bmatrix}$ is the transmitted symbol K$\times$ 1 matrix can be denoted as x, $n = \begin{bmatrix} n_1 \\ n_2 \\ .. \\ .. \\ n_M \end{bmatrix}$ is the additive, independent, and identically distributed, complex Gaussian noise vector with zero mean and unit variance of size $M \times 1$. Hence this equation can be written as

$$y = \sqrt{p_u}\ G\ x + n$$

(2)

III. Massive MIMO Receiver

Considering the first user as the desired user. The received signal can be split into the desired signal, inter-user interference, and noise.

A. Maximum-Ratio Combining (MRC)

Here, for each stream, the BS maximizes the received SNR, ignoring the effect of multiuser interference.

The received signal can be represented as

$$y\ = \sqrt{p_u} g_1 x_1 + \sqrt{p_u} \sum_{i=2}^{K} g_i x_i + n$$

(3)

Where, $\sqrt{p_u} g_1 x_1$ is the desired signal part, $\sqrt{p_u} \sum_{i=2}^{K} g_i x_i$ is the interference due to other users, and n is the noise.

For simplicity, we are using the matched filter at the receiver for user 1. Then the received vector for the matched filter can be written as

$$r_1 = \frac{g_1^H}{\|g_1\|}\ y$$

On substituting (3) in the above equation,

$$r_1 = \frac{g_1^H}{\|g_1\|}\left(\sqrt{p_u} g_1 x_1 + \sqrt{p_u} \sum_{i=2}^{K} g_i x_i + n\right)$$

$$= \sqrt{p_u}\|g_1\| x_1 + \sqrt{p_u} \sum_{i=2}^{K} \frac{g_1^H}{\|g_1\|}\ g_i x_i + \frac{g_1^H}{\|g_1\|}\ n$$

(4)

Here, $\sqrt{p_u}\|g_1\| x_1$ is the desired signal, let us consider the symbol power of $x_1 = 1$, then the desired signal power will be $p_u\|g_1\|^2$, the second term of expression $\sqrt{p_u} \sum_{i=2}^{K} \frac{g_1^H}{\|g_1\|}\ g_i x_i$ is the interference corresponding to user i, then the interference power will be $p_u \beta_i$ is a unit norm beamformer.

Now we can calculate the signal to noise plus interference power ratio (SINR) from the given equation.

$$r_1 = \sqrt{p_u}\|g_1\| x_1 + \sqrt{p_u} \sum_{i=2}^{K} \frac{g_1^H}{\|g_1\|}\ g_i x_i + \frac{g_1^H}{\|g_1\|}\ n$$

$$SINR = \frac{p_u\|g_1\|^2}{p_u \sum_{i=2}^{K} E\left\{\left|\frac{g_1^H}{\|g_1\|} g_i\right|^2\right\} + E\left\{\left|\frac{g_1^H}{\|g_1\|} n\right|^2\right\}}$$

(5)

From the beamforming gain property, we can write $E\left\{\left|\frac{g_1^H}{\|g_1\|} g_i\right|^2\right\} = \beta_i$, and the noise sample has the unit variance $E\left\{\left|\frac{g_1^H}{\|g_1\|}\ n\right|^2\right\} = 1$

We can write the expression for massive MIMO SINR as

$$SINR = \frac{p_u\|g_1\|^2}{p_u \sum_{i=2}^{K} \beta_i + 1}$$

(6)

Power scaling

If E_u is the user power, then considering the power scaling factor $p_u = \frac{E_u}{M}$ such as the power of each user is decreased inversely as the number of antennas.

After power scaling, the SINR will be

$$SINR = \frac{p_u\|g_1\|^2}{p_u \sum_{i=2}^{K} \beta_i + 1}$$

$$= \frac{\frac{E_u}{M}\|g_1\|^2}{\frac{E_u}{M} \sum_{i=2}^{K} \beta_i + 1}$$

$$= \frac{E_u \frac{\|g_1\|^2}{M}}{E_u\left(\frac{1}{M} \sum_{i=2}^{K} \beta_i\right) + 1}$$

(7) For a large number of antennas (M), $k \ll M$, and by

the channel hardening property $\left(\frac{1}{M}\sum_{i=2}^{K}\beta_i\right) \to 0$ and $\frac{\|g_1\|^2}{M} = \beta_1$.

Then the SINR can be given as

$$SINR = E_u\beta_1. \quad (8)$$

This expression shows the interference is not present in SINR, which means interference is suppressed in this receiver. Therefore, massive MIMO can suppress multiuser interference. The power can be decreased over 1/M while maintaining constant SINR, which is a significant advantage of using a massive MIMO linear receiver.

B. Zero-Forcing Receiver (ZF)

As opposed to MRC, the ZF perceives the interuser interference and does not consider the effect of noise.

In ZF, the multiuser interference is suppressed by accurately multiplying the received vector by the channel matrix G's pseudo-inverse [12], [13].

The received signal vector for massive MIMO is given as

$$y = \sqrt{p_u}Gx + n$$

For ZF receiver, at high SNR,

$$\check{y} = (G^H G)^{-1}G^H y \quad (9)$$

$$\check{y} = (G^H G)^{-1}G^H\sqrt{p_u}\,G\,x + (G^H G)^{-1}G^H n$$

$$= (G^H G)^{-1}G^H G\sqrt{p_u}\,x + (G^H G)^{-1}G^H n$$

$$= \sqrt{p_u}\;x\; + (G^H G)^{-1}G^H\,n$$

It can be written as

$$\check{y} = \sqrt{p_u}\;x\; + \check{n} \quad (10)$$

Where $\check{n} = (G^H G)^{-1}G^H\,n$, is the noise. This expression shows that the ZF receiver zeroes the interference between different users or bit-streams.

The rate performance is given by

$$R = log_2(1 + \text{SINR}) \quad (11)$$

IV. NUMERICAL RESULTS

The numerical results are discussed in this section. The considered simulation parameters are shown in Table 1.

Fig. 2 shows the MRC and ZF receivers' rate performance for the supposed system without power scaling for a different number of base station antenna *M* and *K* users. It can be seen that the ZF detector performance is better than MRC without power scaling. As with high transmission power, MRC doesn't suppress inter-user interference.

Fig. 3 considers the power scaling and shows the MRC and ZF receivers' rate performance for the same parameters as in the previous plot.

Table 1: Simulation parameters

Number of a base station antenna	20-520
Number of users	10
User power	10 dB

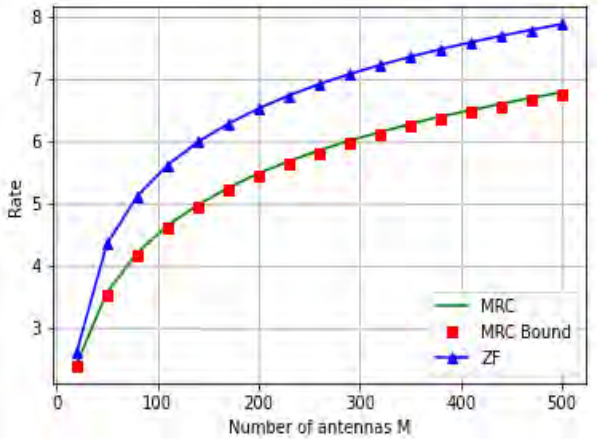


Fig. 2 Rate for MRC and ZF receiver without power scaling

In the considered system model, the BS antennas communicate with ten users, each having a single antenna. The receiver end at the BS uses the MRC or ZF receiver for detecting the signal. The user power is assumed as 10 dB. As shown in Fig. 3, the MRC outperformed the ZF at low SNR when the user power is scaled by *M*. Thus, with low transmission power, the MRC detector is a suitable choice.

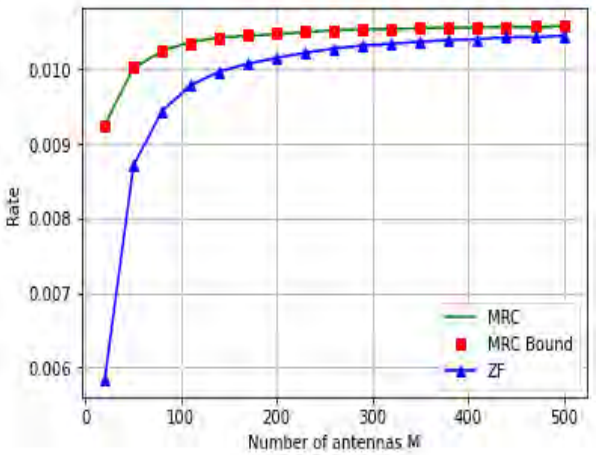


Fig. 3 Rate for MRC and ZF receiver with power scaling factor M

V. CONCLUSION

Many studies have been performed for theoretical analysis of massive MIMO systems, but many more issues limit the system's practical realization performance. We tried to discuss the massive MIMO

systems with their mathematical model and related simulation results in this work. Post detection, namely, MRC, ZF, and beamforming, have been discussed inside this paper. Simulation results show that the ZF receiver performs better than MRC when power scaling is not considered. In the case of power scaling, the MRC outperforms the ZF receiver at low SNR. The mathematical expression and simulation result shows that the MIMO system's performance increases with an increase in BS antennas.

VI. REFERENCES

[1] D. Gesbert, M. Kountouris, R. W. Heath, Jr., C.-B. Chae, and T. Sälzer, "Shifting the MIMO paradigm." *IEEE signal processing magazine* 24, no. 5, pp. 36-46, 2007.

[2] S. Yang and L. Hanzo, "Fifty years of MIMO detection: The road to large-scale MIMOs." *IEEE Communications Surveys & Tutorials* 17, no. 4, pp. 1941-1988, 2015.

[3] E. Björnson, J. Hoydis, and L. Sanguinetti, "Massive MIMO networks: Spectral, energy, and hardware efficiency." *Foundations and Trends in Signal Processing* 11, no. 3-4 pp. 154-655, 2017.

[4] T. L. Marzetta, "Noncooperative cellular wireless with unlimited numbers of base station antennas." *IEEE transactions on wireless communications* 9, no. 11, pp. 3590-3600, 2010.

[5] T. L. Marzetta, E. G. Larsson, H. Yang, and H. Q. Ngo, *Fundamentals of massive MIMO*. Cambridge University Press, 2016.

[6] H. Q. Ngo, *Massive MIMO: Fundamentals and system designs*. Vol. 1642. Linköping University Electronic Press, 2015.

[7] E. G. Larsson, O. Edfors, F. Tufvesson, and T. L. Marzetta, "Massive MIMO for next generation wireless systems." *IEEE communications magazine* 52, no. 2, pp. 186-195 2014.

[8] T. Li and M. Torlak, "Performance of ZF linear equalizers for single carrier massive MIMO uplink systems." *IEEE Access* 6, pp. 32156-32172, 2018.

[9] H. Q. Ngo, E. G. Larsson, and T. L. Marzetta, "Energy and spectral efficiency of very large multiuser MIMO systems." *IEEE Transactions on Communications* 61, no. 4, pp. 1436-1449, 2013.

[10] J. C. Marinello and T. Abrão, "BER analysis of multi-cellular MIMO systems with increasing number of BS antennas." *arXiv preprint arXiv:1406.3753,* 2014.

[11] Jamal Beiranvand and Hamid Meghdadi, "Analytical performance evaluation of MRC receivers in massive MIMO systems." *IEEE Access* 6, pp. 53226-53234, 2018.

[12] N. Fatema, G. Hua, Y. Xiang, D. Peng, and I. Natgunanathan, "Massive MIMO linear precoding: A survey." *IEEE systems journal* 12, no. 4, pp. 3920-3931, 2017.

[13] R. Chopra, C. R. Murthy, H. A. Suraweera, and E. G. Larsson, "Performance analysis of FDD massive MIMO systems under channel aging." *IEEE Transactions on Wireless Communications* 17, no. 2, pp. 1094-1108, 2017.

Feed Location and Impedance Matching in MSA

Saher Ansari
Electronics and Telecommunication Department,
Thakur College of Engineering and Technology,
Mumbai,India
saheransari5597@gmail.com

***Abstract*— Matching antenna is very important aspects in wireless communication as it leads to successful establishment of communication link at desired frequency and distance. In this paper a complete analysis is dedicated for antenna feed location and its impact on antenna impedance. This work can be helpful to antenna designer to identify correct location of feed in less iterations.**

Keyword*— *MSA, gain, impance matching, return loss, probe feed.

I. INTRODUCTION

Printed technology has contributed in a big leap in printed circuit. Printed microstrip antenna (MSA) is now an essential component in the field of wireless communication. Since 1970 only there has been continuous improvement in the design and analysis of MSA. Complete theory of antenna can be found in literatures [1]. In every literature it is mentioned that the feed location plays very important role in achieving a matched condition of antenna. But, for a designer information should be available in terms of data. In this paper a complete analysis about the feed location and its impact on return loss and efficiency is done and can be very useful for any novice working in the area of MSA.

Section II is dedicated to the analysis of feed location on antenna performance. Analysis is centered around probe feed and the preferred feed technique is probe feed. Further, probe feed is divided in two sections. First analysis is dedicated to feed along the antenna axis and second part is dedicated to analysis of feed along diagonal of the antenna.

Section III is dedicated to impact of feed location on the efficiency of antenna and finally in section IV conclusion is projected.

II. ANALYSIS OF IMPACT OF FEED LOCATION ON ANTENNA PERFORMANCE

Feed location is categorized in two parts, one along the y-y' axis of the antenna and other along the diagonal of the antenna. Fig. 1 shows the two cases.

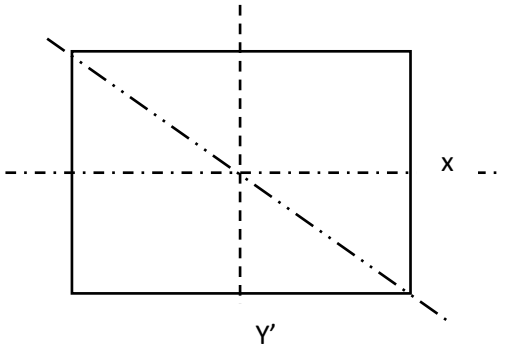


Fig. 1. A MSA with different feed locations.

Antenna feed can be of microstrip or probe feed. Microstrip feed has got the advantage of impedance matching using impedance transformation through different lines. Probe feed dose not require any design but it is difficult to locate it with correct impedance matching. A microstrip antenna (MSA) of 81x81 mm^2 is chosen to resonate at 866 MHz. Substrate is FR-4 with thickness of 1.6 mm. Ground plane of the antenna is 130x130 mm^2. Entire analysis if executed using CST studio. Table 1 shows the antenna impedance when feed is along y-y'.

Table 1. Impact of feed location along y-y' axix on antenna impedance and return loss.

Feed location (mm)	Antenna impedance		Return loss (dB)
	R	X	
0	0.059	7.5	0
5	2.2	6.5	-0.8
10	9	5	-3.24
15	19.6	2.8	-7.16
20	31.6	-0.19	-12.97
25	43.9	-3.24	-22.7
30	54.6	-5.6	-23
35	61.4	-8.6	-17.8

Feed location 0 in Table 1 shows the center of the antenna. It can be concluded from the table that if feed is away from center and near the edge of the antenna then the antenna impedance is higher and matching can be achieved easily. Since the antenna dimension is 81x81 mm^2, then F/W should be 30% to 43%, where

w is width of square patch antenna. Now, another case can be taken as feed along the diagonal of MSA.

Table 2. Impact of feed location along diagonal on antenna impedance and return loss.

Feed location (mm)	Antenna impedance		Return loss (dB)
	R	X	
0	0.059	7.5	0
5	4.9	6.4	-1.68
10	18.5	3.2	-6.72
15	38.6	-1.5	-17.72
20	61.78	-6.86	-18.25
25	84.74	-11.8	-11.3
30	104	-15.4	-8.7
35	115	-19.5	-7.7

From Table 2 it can be concluded that the impedance matching can be achieved away from the center of the patch as it is observed in earlier case. The diagonal length is144.55 mm. Therefore, if the ration F/D is from 10% to 17% then matching can be achieved.

III. ANALYSIS OF IMPACT OF FEED LOCATION ON ANTENNA EFFICIENCY

Though MSA suffers with poor efficiency, improper feed location leads to further degradation of antenna performance as shown in Table 3.

Table 3. Antenna efficiency for feed location along diagonal of antenna.

Feed location (mm)	Antenna Efficiency (%)	Antenna Efficiency (%)
0	0	0
5	3.3	6
10	10	15
15	15	19.4
20	18.6	19.5
25	19.6	18.4
30	19.66	17.2
35	19.4	15.5

It can be observed that the antenna efficiency is maximum when antenna is highly matched. This is true as the antenna reactance improves in near field radiation and very less power is available in far field which leads to fall in antenna efficiency. The maximum efficiency of the antenna is nearly 20% for both the feeding technique.

IV. CONCLUSION

It can be concluded that the probe feed should be located in the range of F/W ratio of 30% to 43% when feed is located along vertical or horizontal axis and when feed is along diagonal axis then it should be located in 10% to 17% of diagonal length. This data can be used to reduced number of iterations in locating probe feed.

REFERENCE

[1] Constantine A. Balanis *Antenna Theory: Analysis and Design*, 3rd ed. Wiley Intescience, 2005.

Stub Loaded Circular Polarized Array Antenna for RFID Application

Shastri Shailendra Pratap
Thakur college of engineering and technology, Mumbai, Maharashtra, India

Vinitkumar Dongre
Thakur college of engineering and technology, Mumbai, Maharashtra, India

Archana Deshpande
Thakur college of engineering and technology, Mumbai, Maharashtra, India

Nikhil Tiwari
Thakur college of engineering and technology, Mumbai, Maharashtra, India

***Abstract* – In RFID application it is always desirable to have circular polarized reader antenna. Which gives freedom to detect RFID tag in any alignment, either vertical, horizontal or any intermediate position. In microstrip antenna it is very difficult to achieve circular polarisation at desired frequency using standard design formulas. To achieve circular polarization at desired frequency takes multiple iterations of antenna designing. In this paper circular polarisation is achieved for single MSA as well as array of 2 by 2 at 866 MHz. By designing a stub circular polarization can be achieved at desired frequency in minimum iterations. For an antenna axial ratio of 1.9 dB is achieved with reflection coefficient of -14.86 dB and array gives axial ration better than 0.855 dB. It is observed that there is no significant impact on radiation pattern due to use of stub. It can also be observed that F/B ration of antenna is more than 20 dB.**

Index Terms* – *array, beamwidth, MSA, open stub, miccrostrip line.

I. INTRODUCTION

Circular polarization is the requirement of uninterrupted communication therefore antenna having this property are more preferred than the linearly polarized antenna. There are multiple techniques of circular polarization in miccrostrip antenna (MSA) [1].
It is observed that getting circular polarization at desired frequency with better tuning is a difficult task and requires multiple iteration of antenna design. This takes lot of time. In this paper a simple technique is proposed to reduce the number of iterations to save time and complete the design.

II. DESIGN OF CIRCULAR POLARIZED MSA ANTENNA

Fig. 1 shows a square miccrostrip antenna (MSA) with trimmed corners. Trimming corners of MSA antenna is a conventional technique to produce circular polarization. L X W is 41x41 mm2 and the slit is cut at 450 angle with slit width of 3mm and length of 33 mm. Feed width is 3 mm and length is 5 mm. This dimension is chosen to ensure a 50 Ω line. The slit causes generation of tow orthogonal modes to generate circular polarized radiation. The generation of CP adiation requires multiple iteration and is very time consuming.

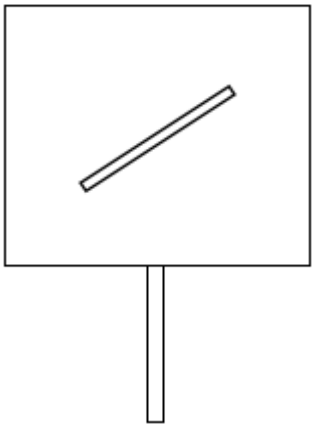


FIG. 1. Circular Polarized MSA antenna.

It can be observed in Fig. 2 that the antenna is tuned at 844 MHz with axial ration of 2.8 dB at 866 MHz as shown in next figure Fig. 3.

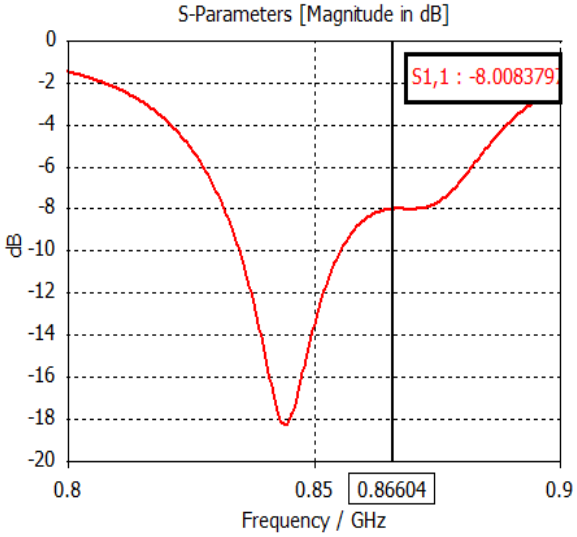


Fig. 2. Return loss V/S frequency of designed antenna.

Fig. 4 shows the impedance as function of frequency. It can be observed that the antenna has resistance of 21.69 Ω but the reactance is -4.59 Ω and is very large. In order to suppress this reactance and tune antenna without disturbing the axial ration, a stub can be connected in shunt with the antenna.
Analysis of the antenna impedance at 866 MHz in VSMITH software shows that in order to transform the above impedance into 50 Ω at 866 MHz, a line of 50 Ω with length of 38 mm is needed. At this length an open

circuited stub of 32.2 mm length and impedance of 40 Ω is sufficient. This requires stub of width 4.5 mm.

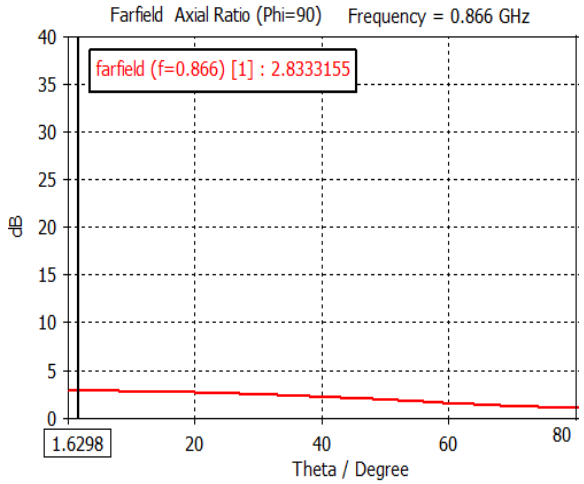


Fig. 3. Axial Ration V/S frequency of designed antenna.

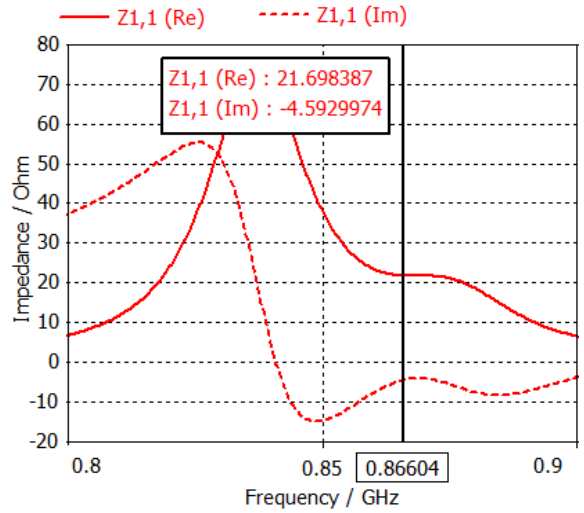


Fig. 4. Antenna impedance V/S frequency.

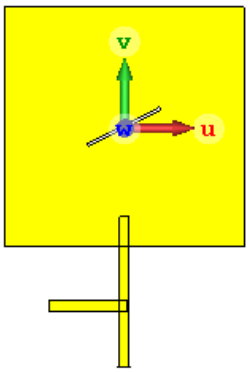


Fig. 5. MSA with an open circuited stub.

After a few iteration it is observed that a line length for the location of the stub should be 30 mm and width of the stub should be 3 mm to achieve a matched condition at 866 MHz.

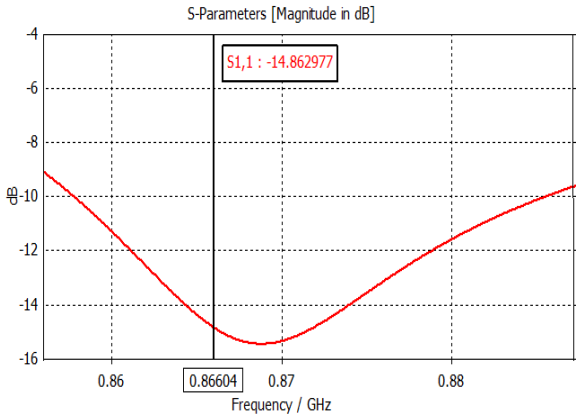


Fig. 6. Return loss V/S frequency of stub loaded antenna.

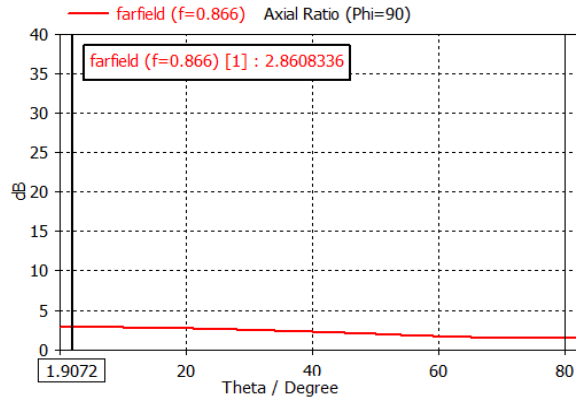


Fig.7 Axial Ration V/S frequency

Fig. 6 and Fig. 7 confirm that the antenna is tuned at 866 MHz with axial ratio of 2.8 dB at bore.

III. Design of Array Antenna

In order to improve the gain of the antenna, the designed MSA is used to make an array of 2x2. The distance between antennas should be λ0/2 [1]. The distance calculated is 173 mm. The arrangement of the 2x2 array is shown in Fig. 8. The array is fed with the help of 1:4 power divider using quarter wave transformers. Signal is given to a 50 Ω line and power is divided between two 100 Ω lines. This power goes to 70.71 Ω quarter wavelength lines on both sides to feed 1x2 array on each side. These lines further feed to 100 Ω lines and then two quarter wave transformers of 70.7 Ω. The details of the structure is shown in Fig. 9.

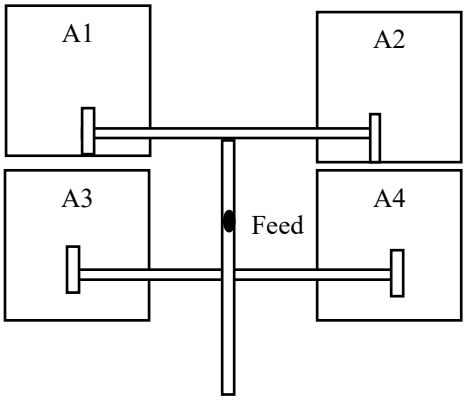


Fig. 8. Array of slotted CP antenna.

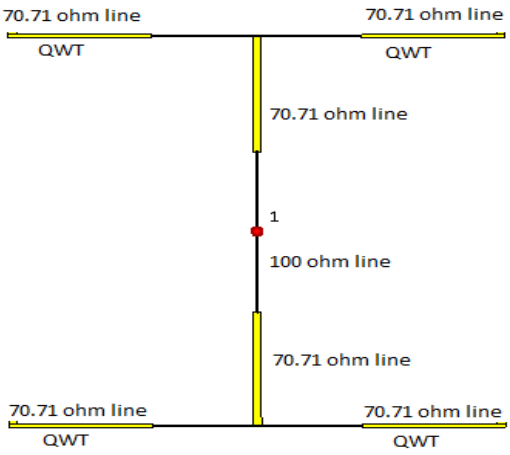


Fig. 9. Feed with different quarter wave transformers for array antenna.

Fig. 10 confirms the tuning of antenna with the proposed technique and Fig. 11 shows the axial ratio of the array antenna. It can be observed that the array gives an axial ration better than 0.855 dB at bore.

The array is designed to fulfil not only the axial ratio but high gain too. Fig. 12 shows antenna radiation pattern in two dimensional plane. It is observed that the antenna beamwidth is 54.8^0. Antenna directivity is 10.7 dBi.

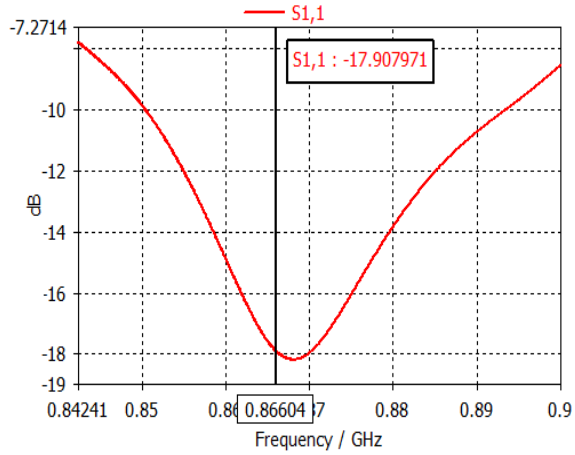


Fig. 10. Return loss V/S frequency of stub loaded array antenna.

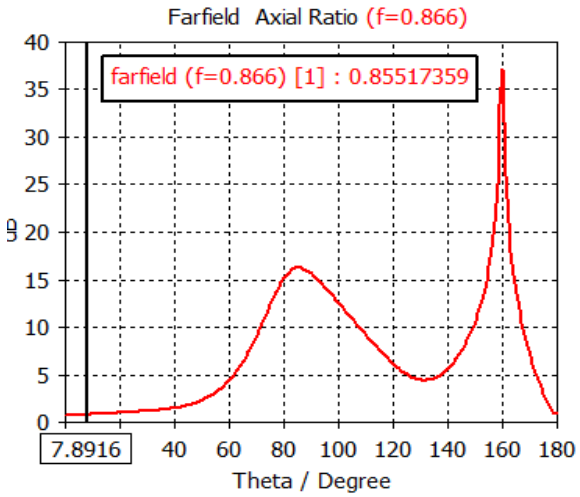


Fig. 11. Axial Ration V/S frequency of array antenna.

In order to analyze the impact of stub on radiation patter, radiation pattern of single antenna and array antenna is plotted in Fig. 12 (a) and (b) respectively.

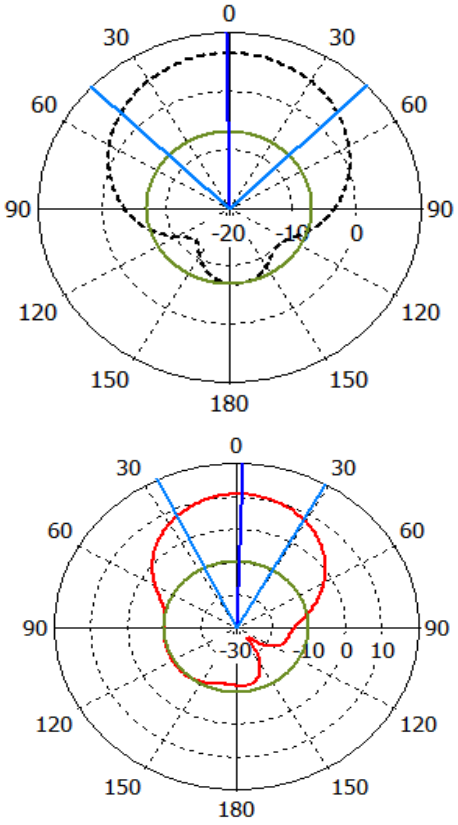


Fig. 12. Radiation pattern of antenna in θ-plane (a) single patch antenna and (b) array antenna.

It can be observed from figures 12, that the main lobe is not affected by the introduction of stub. The back radiation has got little change as compare to single antenna but back radiation in case of array is smaller than the back radiation form the single antenna.

It can also be observed that F/B ration of antenna is more than 20 dB in case of array. The radiation maximum is existing at 2^0.

IV. CONCLUSION

Achieving circular polarization at desired frequency is a difficult task and requires more iterations of design. The proposed technique intend to reduce number of iterations. Circular polarization can be achieved at desired frequency irrespective of the tuning frequency and later on a shunt stub can be added to main feed to tune the antenna at desired frequency.

REFERENCE

[1] Constantine A. Balanis *Antenna Theory: Analysis and design*, 2nd ed., Wiley, 2005.

This page is kept blank intentionally

Brain Structure Analysis Based On Naïve Bayes and Random Forest Approach

T. R. Ganesh Babu
Department of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram
India
ganeshbabutr@gmail.com

U. Saravanakumar
Department of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram
India
saran.usk@gmail.com

J. Rangarajan
Department of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram
India
rangarajan.j.ece@mec.edu.in

R.Praveena
Department of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram
India
praveena.r.ece@mec.edu.in

V.Tharani
Department of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram
India
tharaniroshan98@gmail.com

S. Vaishnavi
Department of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram
India
vaishusenthil20@gmail.com

***Abstract*—A brain tumour is an irregular brain cell collection or mass. Your skull is very rigid that surrounds your brain. Growth can cause problems within such a restricted environment. The brain structure analysis based on machine learning approach is presented. Initially, the brain images are given to Stationary Wavelet Transform (SWT) for decomposition and it produces sub-band coefficients. Then these sub-band coefficients are used for classification using random forest and naïve bayes classifier. The result section discusses about the performance evaluation of proposed mammogram classification system.**

Keywords—Brain tumor analysis, Stationary wavelet transform, Sub-band coefficients, Naïve bayes, Random forest

I. INTRODUCTION

A tool for classifying a typical or abnormal representation of the MR brain based on a Neural Network (NN). This technique first uses a transforming wavelet to remove image features, followed by the review of the main factor approach to reduce the object dimensions [1]. The reduced features are transmitted to a back NN, which is used for the optimum determination of the NN in normalized conjugate gradient.

First, the approach used a discrete wavelet to extract image features and then the principle component analysis technique was employed to reduce the feature size. The decreased features have been transmitted to a feed-forward network that optimizes the parameters through an improves fitness and chaotic theory [2]. The improved algorithm was referred to as the scaled chaotic bee colony. In order to prevent over fitting the K-fold stratified cross validation was also used.

A better version of orthogonal discrete wavelet transformation (DWT), called slantlet transform, can be used particularly to boost position of time with short filter supports simultaneously. We determined its histogram for every two-dimensional MR image, and on this histogram signal, Slantlet transformation was applied [3]. Then, Slantlet magnitudes convert outputs equal to six space positions, selected by a particular logical process, for each image is generated by considering a feature vector [4]. The derived features are used to train a binary classifier based on a neural network.

The approach used to derive functions from MR brain images by stationary wavelet transformation (SWT). Last, the main study of the components was used to decrease SWT coefficients [5]. Finally, we suggested the use of 2 classifiers, namely the generalized GEPSVM and the radial basis function kernel GEPSVM.

In the first step, we must receive and transform the MR image to data in the second phase with a reduction of dimensions using the theory analysis of component sections, the back-neural network then is used as a method to identify subjects as normal or abnormal images of the brain [6]. In the preprocessing stage, the given images are de-noised by means of a median filter. The noisy images are then shown as transformations inputs to the wavelet. The transforming wavelet is used for extracting apps. The majority of techniques of transformation yield coefficient values of the same size as the original image [7]. Predefined wavelet families such as Daubechies (db8), Biorthogonal (bio3.7) and Symlets (sym8) are used.

This study discusses analysis of the structure of the brain based on the method of machine learning. In Section 2 we define the materials and methods. The remainder is arranged as follows. Section 3 describes the experimental results and debate. The last segment ends with the program suggested.

II. METHODS AND MATERIALS

Firstly, SWT is given the brain input images for decomposition and produces the coefficients on the

sub-band. Then the classification of brain images is used for the random forest and naive bayes. Figure 1 shows the workflow of proposed brain analysis system.

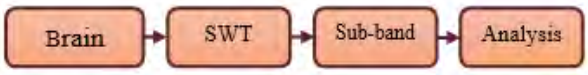


Fig. 1 Brain image classification - workflow

III. Stationary Wavelet Transform

SWT is a wavelet algorithm that transforms the discrete wavelet and prevents the loss of its translation. Invariance is reached by the removal of down samplers and up samplers in the DWT and an algorithm factor in the filter coefficients.

The SWT is a redundant system intrinsically since the output at each SWT level is as high as the input, and thus N in the coefficients for N level decomposition occurs. SWT is a redundant system. The some of the applications of SWT are, pattern recognition and signal denoising.

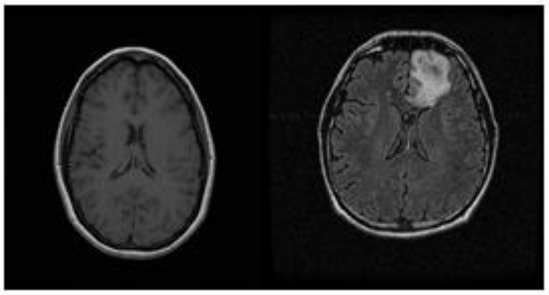
IV. Classification using Machine Learning Clasifier

Naïve Bayes is a collection of simple and reliable classifiers based on the Baye theorem, which assumes strongly independence among the characteristics. The simplest network models in Bayesian. Nevertheless, they can be combined with kernel density measurements and obtained more precision. Naïve Bayes classification systems are incredibly scalable, allowing for a variety of parameters that are constant in the number of learning variables [8-9].

Random forests or random decision-making forests are an ensemble training method for classification, regression and other activities, which operate by setting up a number and generating class or mean prediction for individual trees in many decision-making entities during training. Random forests correctly dominate decision makers in their training pattern.

V. Results And Discussion

The performance of brain tumour analysis is measured in terms of accuracy. The mammogram images are used for performance. The sample mammogram images are shown in figure 2.



(a) Normal *(b) Abnormal*

Fig.2 Sample brain images in database

First, SWT is given input brain images to decompose and to generate sub-band coefficients. Finally, classification classifications such as naive bays and random woods are used. Table 1 shows the performance of proposed system using brain images.

TABLE I : Performance of Brain Classification using SWT

SWT levels	Performance of hybrid classifiers (Naïve bayes and random forest) (%)		
	Accuracy	Sensitivity	Specificity
1	89	90	91
2	91	92	93
3	96	97	95
4	94	95	93

From the above table, the maximum accuracy of classification obtained in the SWT decomposition and hybrid classifier 3rd stage of 96% has been observed. Its sensitivity and specificity using SWT functions are 97% and 95%. Figure 2 shows the graphical representation of proposed brain tumor analysis.

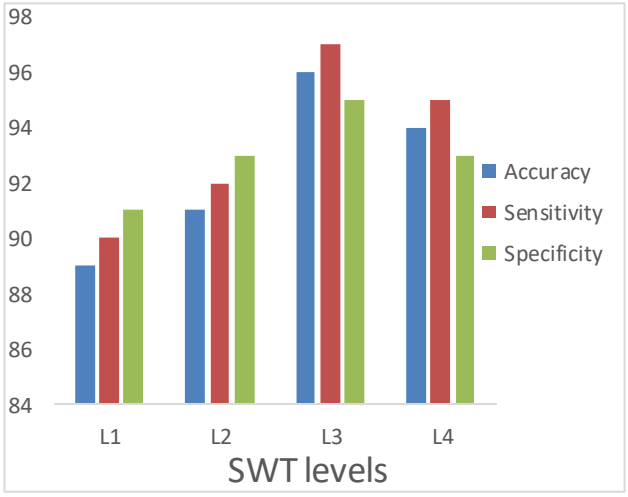


Fig. 3 Graphical representation of proposed brain tumor analysis

VI. Conclusion

Brain structure analysis based on machine learning approach is presented in this study. At first, the normal and abnormal brain images are given to SWT for decomposition at 4 levels. Then the naïve bayes and random forest classifier is used for classification. The maximum classifier accuracy is 96% obtained at the 4th decomposition level and hybrid classifiers like naïve bayes and random forest. The minimum classification accuracy is 89% obtained at the 1st level of SWT decomposition and hybrid classifiers.

References

[1] Zhang, Y., Dong, Z., Wu, L., & Wang, S. (2011). A hybrid method for MRI brain image classification. Expert Systems with Applications, 38(8), 10049-10053.

[2] Zhang, Y. D., Wu, L., & Wang, S. (2011). Magnetic resonance brain image classification by an improved artificial bee colony algorithm. Progress In Electromagnetics Research, 116, 65-79.

[3] Zhang, Y. D., Wang, S., & Wu, L. (2010). A novel method for magnetic resonance brain image classification based

on adaptive chaotic PSO. Progress In Electromagnetics Research, 109, 325-343.

[4] Maitra, M., & Chatterjee, A. (2006). A Slantlet transform based intelligent system for magnetic resonance brain image classification. Biomedical Signal Processing and Control, 1(4), 299-306.

[5] Zhang, Y., Dong, Z., Liu, A., Wang, S., Ji, G., Zhang, Z., & Yang, J. (2015). Magnetic resonance brain image classification via stationary wavelet transform and generalized eigenvalue proximal support vector machine. Journal of Medical Imaging and Health Informatics, 5(7), 1395-1403.

[6] Ibrahim, W. H., Osman, A. A. A., & Mohamed, Y. I. (2013, August). MRI brain image classification using neural networks. In 2013 international conference on computing, electrical and electronic engineering (ICCEEE) (pp. 253-258). IEEE.

[7] Mohankumar, S. (2016). Analysis of different wavelets for brain image classification using support vector machine. International Journal of Advances in Signal and Image Sciences, 2(1), 1-4.

[8] Ranganathan, S. (2019). Rain Removal in the Images Using Bilateral Filter. International Journal of MC Square Scientific Research, 11(1), 9-14.

[9] Manahoran, N., & Srinath, M. V. (2017). K-Means Clustering Base Marine Image Segmentation. International Journal of MC Square Scientific Research, 9(3), 26-29.

This page is kept blank intentionally

Pothole Reporting System for Safe Roads

Kedar Sawant
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
sawantkedar66@gmail.com

Shrikant Shelar
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
shrikant.shelar5325@gmail.com

Devashish Palyal
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
devpalyal99@gmail.com

Dr. Payel Saha,
Professor
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
payel.saha@thakureducation.org

***Abstract*— INDIA, the second most developing Country in the World and a fast growing economy, is known to have the broad network of roads. Roads are an essential part of people's day-to-day lives. They carry almost 90 percent of the country's passenger traffic and 65 percent of its cargo. Poor condition of roads affect the country and its development. Potholes in roads are a huge nuisance to drivers. Majorly accidents occur because people have tendency to avoid potholes during which they hit other vehicles. There are over 25,000 vehicle accidents reported in India due to potholes in 2019 of which around 300 have led to death. Poor road conditions also effect the economy as people drive over potholes at high speed which causes not only causes vehicle damage but also at times damages the goods carried by transporting vehicles. It also increases the travel time which slows communication and transportation. So system is to be developed which helps to alert the driver of upcoming potholes. This paper discusses a cost effective solution for detection of potholes and make the driver aware of them. An ultrasonic sensor is used to identify the potholes and humps, also to measure their depth. Geographical location coordinates of the potholes is also recorded using a Global Positioning System. The sensed data includes type of obstruction (pothole or hump), location of pothole and depth of pothole. This data is sent to a server, the server sends a timely notification when around 10 meters from the potholes to notify the driver. This notification will be given by the module in form of voice commands. The data of the server is published on a website and on a map. People can also use website to observe locations of potholes.**

Keywords—Pothole, Internet of Things, Ultrasonic Sensor, ESP 8266 Node 32, Buzzer, GSM module, , SIM 800, GPS

I. INTRODUCTION

Potholes are one of the major reasons which hamper smooth transportation and development of any region, by implementing the proposed system, civic authorities will be able to increase operational efficiency, reduce waste, and improve the response of the system.

From various research papers and reports on road accidents studied, it was clear that the major reason for road accident death was the condition of roads. The proposed system would inform the user about upcoming potholes continuously, so that the driver can slow down his vehicle and thus be careful on such roads, thereby reducing the probability of the accidents. Many systems available possess image processing systems or use the accelerometer present on the smartphones but these systems are very costly and in case of image processing systems certain lighting conditions are required to make them work, so developing an IOT based system which will be quite cheap as compared to the above systems is what the proposed system aims for. Market potential of this system is very high. In India, passenger vehicles purchased during 2019 was approximately 3.4 million. If this system is integrated in vehicles as a part (component), market is huge. Old vehicles can add this system to their vehicles.

A system is built for monitoring potholes or humps by using ultrasonic sensors [1]. Using ultrasonic sensor is the better option after comparing with Image processing and accelerometer [2], [3], [6]. The location of potholes is sent to a server with the help of GSM/GPRS SIM808 [4]. The locations of potholes on servers is published on a website so it can be accessed by everyone. The driver is alerted about the upcoming potholes using a simple notification method.

The civilians will be able to report conditions from anywhere with the help of a website. The proposed system focuses on delicate vehicle passengers such as people with back problems, pregnant individuals. It can also be implemented on bikes which is very necessary during monsoon season. Hump detection using IOT is more efficient when compared with the conventional approach.

In India penetration of GSM technology is a problem, especially in rural areas. Network providers are not available at all locations. In moving vehicles at high-speed GPS and GSM also have problems in receiving signals, this may also affect the system function. A powerful antenna and receiving system can improve the connectivity of the system.

II. SCOPE OF PROJECT

The proposed system tackles the problem of detecting potholes by installing hardware equipment on the base of a vehicle. The hump or the pothole will be detected by the ultrasound sensor which will update and send its location to the database. The civic authorities had developed a portal where citizens could click the picture and tag the location of the pot holes but this proved to

be futile in case of busy roads as a driver could not get out of his vehicle and report the pothole. The system will help the driver to report the pot holes or humps while driving.

The proposed system will mostly be aimed toward passenger vehicles. It is very essential for passenger vehicles to avoid potholes as the suspension in these vehicles are damped and cannot tackle potholes very well, which in turn causes invisible damage to vehicle which increases over time. This system is also aimed towards carrying delicate passengers for ambulance or for people having back issues and most importantly pregnant women. Being the country having one of the highest two wheelers population this system also aims to reduce the two wheelers casualties.

III. METHODOLOGY

A. Components

HC-SR04 Ultrasonic Sensor, this unit continuously measures distance between itself and the object in front of it, the sensor provides a range of 2-100cms [5], this unit will be interfaced with an Arduino Uno which will convert the analogous data from the senor into digital form [1], [2]. The GPRS and GSM module will also be interfaced with the Arduino to provide internet connection as well as to track the location of vehicle, the Arduino Uno will be interfaced with ESP8266 module which performs the function of transmitting data via internet, the coordinates and the distance captured by the system will be transmitted to the server with the help of this unit.

TABLE I. LIST OF COMPONENTS

Component	**Description**
HCR-04	Ultrasonic Sensor
ESP32SIM800L	Wi-Fi and GPRS module
Ublox NEO-6M GPS Module with EPROM	Global Positioning module
Arduino Uno	Atmega328 Microprocessor

B. Architecture

The proposed system consists of the following section microcontroller module, server module and internet application module [2]. The microcontroller module consists of Arduino, ultrasonic senor HC-SR04, sim800 module as well as GPS node. Server section receives data from the microcontroller module, processes and stores the information. The internet application module uses the data hold on within the server information and provides timely alerts to the user.

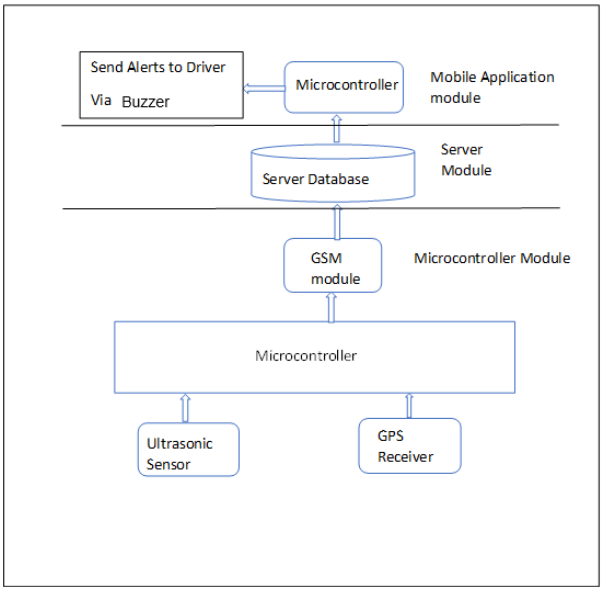


Fig.1 System Architecture

Microcontroller module here Arduino is used, gathers the information about potholes and their geographical locations by GPS and this information is sent to the server. Server module receives information from the microcontroller module and then processes and stores in the database. Web application module uses this information stored in the server database and provides timely alerts to the user, The ultrasonic sensor continuously measures the distance between the ground and the area where it is placed on the vehicle, a ground clearance of 'X' cm is to be set, this will help the system to identify the potholes and humps easily i.e. if the distance is more than the set threshold or if the distance is less than the set threshold distance then the system will record it as a hump. The GSM and GPRS module work simultaneously, the GSM module supplies the internet connection while the GPRS module is used to catch the co-ordinates of a given location.

C. Re-detection of potholes

The system records the previous co-ordinates of the potholes and humps respectively, when the same unit is made to run on the on which it had previously travelled, it will fetch the data stored previously on the data base. [1]

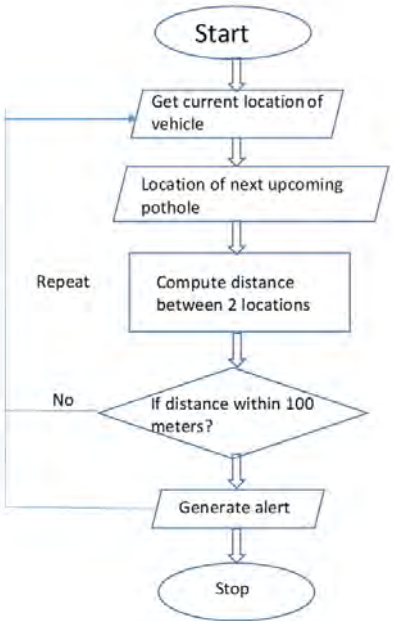


Fig.2 Re-detection working flow

As soon as the previous stored co-ordinates match the previously stored co-ordinate, a voice alert will be triggered via a buzzer before a certain distance, thus the driver can slow down his vehicle beforehand, if the potholes are repaired certain people with admin access can remove those certain co-ordinates from the system.

IV. RESULTS

A. Admin controlled database.

Fig.3 Web application homepage

A prototype framework of a web application has been designed as of now where authoritative people would be given an admin ID and login password to check on the locations reported by users.

B. Data Log System

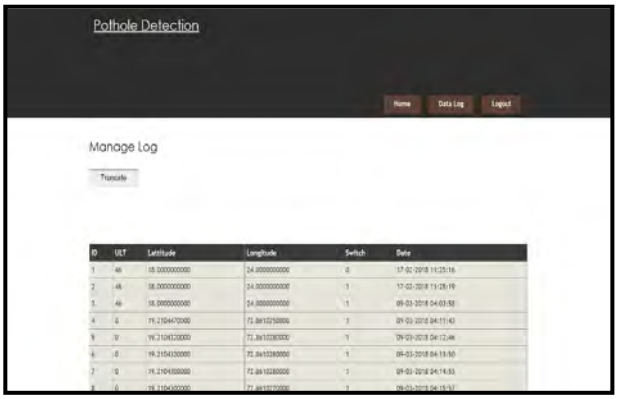


Fig.4 Geographical coo-ordinates of potholes and humps

In the web application system a separate data log menu is placed where all the user reported potholes or humps are shown in the database, if this system is used by civic authorities then the admin can be in continuous contact with the authorities and thus admin can delete the queries from the database which have been repaired .

V. CONCLUSION

The model proposed serves two important purposes; automatic detection of potholes and humps and also alerting vehicle drivers to evade potential accidents. The proposed approach is an economic solution for detection of deadly potholes and uneven humps, as it uses low cost ultrasonic sensors. The web application used in this system is an additional advantage as it provides timely alerts about potholes and humps. This application also registers pothole complaints with the date and location and also it registers one complaint only once. The solution also works in rainy season when potholes are filled with muddy water as alerts are generated using the information stored in the database (cloud). We feel that the solution provided in this paper can save many lives and ailing patients who suffer from accidents. The proposed system considers the presence of potholes and humps on roads it considers the fact that potholes or humps get repaired or fixed by concerned authorities and update server database (cloud) accordingly.

REFERENCES

[1] Rajeshwari Madli, Santosh Hebbar, Praveenraj Pattar, and Varaprasad Golla "Automatic Detection and Notification of Potholes and Humps on Roads to Aid Drivers" IEEE Sensors Journal, Vol. 15, No. 8, August 2015.

[2] Smita Saitwadekar, Payel Saha "Identifying and Reporting of Potholes and Humps using IoT" International Research Journal of Engineering and Technology (IRJET), Febraury, 2019.

[3] Ilaria Bosi, Enrico Ferrera, Daniele Brevi and Claudio Pastrone "In-Vehicle IoT Platform Enabling the Virtual Sensor Concept: A Pothole Detection Use-case for Cooperative Safety" LINKS Foundation – Leading Innovation & Knowledge for Society, Turin, Italy, 2015.

[4] Ajit Danti, Jyoti Y. Kulkarni, and P. S. Hiremath "An Image Processing Approach to Detect Lanes, Pot Holes and Recognize Road Signs in Indian Roads" International

Journal of Modeling and Optimization, Vol. 2, No. 6, December 2012

[5] Nadhir Ibrahim Abdulkhaleq "Investigating the resolution ability of the HC-SRO4 ultrasonic sensor" at 2020 IOP Conference Series: Material Science and Engineering, May 2020.

[6] Byeong-ho Kang and Su-il Choi, "Pothole Detection System using 2D LiDAR and Camera" IEEE 2017.

[7] Pathan Amir khan Ayyub khan, "IoT Based Pothole Detection & Alert System", International Journal for Innovative Research in Multidisciplinary Field, Volume - 4, Issue - 4, Apr – 2018.

Canteen Automation System Using IOT

Shivani Shenoy
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
shivanishenoy18@gmail.com

Himanshu Upadhyay
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
upadhyays444@gmail.com

Pranav Akoliya
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
pranavakoliya10@gmail.com

Dr. Payel Saha,
Professor
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
payel.saha@thakureducation.org

***Abstract*— In today's busy urban lives, it is a struggle for people to beat the traffic and reach office/college on time. Not surprisingly, many are unable to carry home-made food with them to have during lunch time, despite being concerned about health and dietary needs. That's the reason, canteens play a vital role in every individual's life when it comes to fresh, healthy and delicious food. Apart from this, canteens are a great place where everyone can gather and get social. The current system in canteens consist of a manual system that involves the paper work of the billing system and maintaining the files, full of risk and a tedious process. Nowadays people don't have much time to wait in long queues for placing their orders and then once prepared, waiting at counters to collect orders. Many customers visit the canteen in their lunch break and recess so they have limited time to eat and return to their respective office and colleges. So, the proposed system helps them to not only save time by ordering food even before arriving at the canteen but also enables them to track their orders. Including a framework showing how to apply Internet technology progressively, the work demonstrates the route from adapting materials to developing an online environment. This method allows applicants to register online, read and select the food from e-menu card and order food online by just selecting the food that the user desires via an android application.**

Keywords—canteen management, online ordering, canteen automation, preordering foods, android app, smart ordering

I. INTRODUCTION

Automation or automatic control is the use of various control systems for operating equipment such as machinery, processes in factories, boilers and heat-treating ovens, switching on telephone networks, steering and stabilization of ships, aircraft and other applications and vehicles with minimal or reduced human intervention.

In existing system if students want to order something from canteen the student has to physically go to the canteen and place order. Lots of time is spent in queues at a college canteen. Because the present technology is book-based, it has a huge downside of data supremacy, calculations ought to be rendered manually. Another threat is that the data can be easily manipulated or lost. The cash payment also has a big drawback, the user needs to have cash carried with him/her. And he/she wants to pay the precise amount in any other case there is problem for the final amount.

This paper discusses the concept of online food ordering system which can be implemented in canteens via an android application. In this concept of an automatic self-ordering system, chef can get the information about the order on the display screen along with the table number [1]. It provides an extra feature where customers can monitor the status of their orders [2]. The front end was developed using JAVA Android and the backend used MySQL database. The admin was also equipped with a screen to approve the orders placed. Automatic billing generated is displayed on the respected device after order confirmation [3][4][5]. An automated food ordering system is proposed which will keep track of user orders smartly. Basically, it is a food ordering system for different type of restaurants in which user can make an order or make custom food by one click only [6]. The user will login into the website and select the order and place it after confirmation and proceed towards making payment [7]. The system is a combination of android application which would be used by customers as well as web application which would be managed by the Admin.

The proposed system is economically feasible because:

-The system will provide fast and efficient automated environment instead of slow and error prone manual system, thus reducing both time and manpower spent in running the system.

-The system will have GUI interface and very less user training is required to learn it.

-It is very easy and convenient for everyone to download an android application.

-Customers would be able to place an order even before entering the canteen, thus saving their time.

-There will be no crowding at counters to place order. This system would be fully digitized, so efficiency would be greater than the traditional system.

II. METHODOLOGY

A. Flow diagram

The block diagram demonstrates the working of the canteen automation system.There are seven blocks in this block diagram namely start, place order and pay , order confirmed by the manager , customer gets status as order being prepared, once order prepared,"order ready", "order complete" and stop.

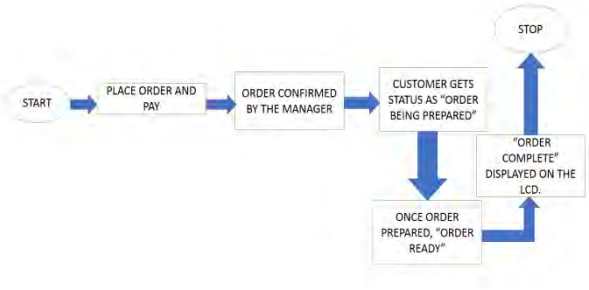


Fig.1. Flow diagram of the proposed system

The first block start indicates start of the process in which the customer will login into the application from his/her android device. In the second block "place order and pay" the customer will go through the menu which is provided in the application and select the dishes he prefers to eat and add those dishes to the cart, after finalising the order the customer will check out the order before the order gets placed the customer will need to pay the bill through digital options and only after that the order will be placed.
After placing the order, the placed order will be displayed on the managers screen as well as the screen of the chef along with order numbers. At this time the customer will get the status as "Order being prepared". Once the order is prepared, the chef clicks "done" on his screen and at this time the customer gets status as "order ready". The completed order will be displayed on the LCD so that it can be collected by the customer from the counter.The final block "stop" indicates completion of the process and the customer can log out of his application.

B. Software Requirements

Operating System : Windows, Android; Technology: Asp.Net C#, Android (Java, XML); Web Technologies: Html, JavaScript, CSS; IDE: Visual Studio 2013, Android Studio; Database: MS SQL Server 2012.

C. Hardware Requirements

1 GB RAM, 200 GB HDD, Intel 1.66 GHz, Processor Pentium 4, A 64 pin microcontroller (ARM LPC-2148), Keypad, LCD (128x32).
A 64-pin microcontroller (ARM LPC-2148) is interfaced with a keypad and an LCD (128x32). As soon as the order is prepared by the chef, he will enter the order number via the keypad. As a result, the order number will be displayed on the LCD so that the customer can collect it from the counter. ARM LPC-2148 comes under ARM 7 version of ARM controllers. This is intended for high end applications involving complex computations. It follows the enhanced RISC architecture. It has high performance and very low power consumption. Here pin no.51 is used for Vdd i.e. 3.3 V power supply, this is the power supply voltage for the core and I/O ports. And pin 52 is use for Vss i.e. Ground 0 V reference. A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals. LCD's are very important devices in embedded system. It offers high flexibility to user as he can display the required data on it [3]. It will connect on the pin 17 of Arm LPC microcontroller. Here we have used it for displaying the orders that are ready.

For the Android Application:
Login page: Every user has to register themselves before using the application. Just after login, the customer would be directed to the menu which would consist of the dishes, their name, their price, description as well as image.

User page:
The user page consists of the following options:
Selection of items: The customer is free to order items as per his choice and availability.
-Cart details: The customer can view his cart before placing his final order and also vary the quantities of the items ordered.
-Payment gateway: The customer is expected to pay online via payment gateways like credit card, debit card, Paytm, Google pay, etc.
-Sign out: This option is used to sign out from the customer's account.
For the Web Application:
The Web application is designed for the Admin. Before using the web application, there would be a login page for the admin as well. In admin login, the manager has to create username and password for himself.

Admin page:
The admin page consists of the following options:
-Add items: The admin can add food items with their prices, category, description, image, etc.
-Edit/Delete items: This option enables the admin to alter the prices in the menu. If a particular dish is out of stock, the admin can even delete that dish for a specified duration.
-Order list: The admin can see the order number as well as the order list of the customers.
-Sign out: This option is used by the admin to sign out from his account.

Chef page:
The chef will only be able to view items placed by the customers. Once he finishes the preparation of the orders, he will select the option "done" on his screen. Then he will enter the order number on the keypad which will then be displaced on the LCD.

III. RESULT

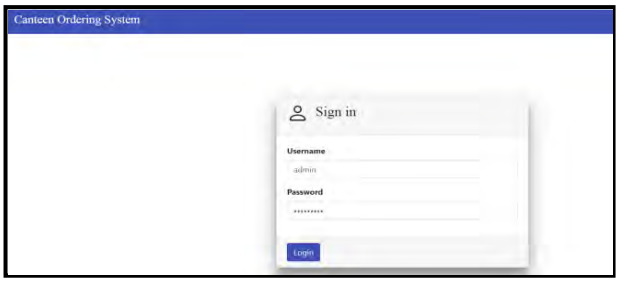


Fig.2. Login page for the Admin

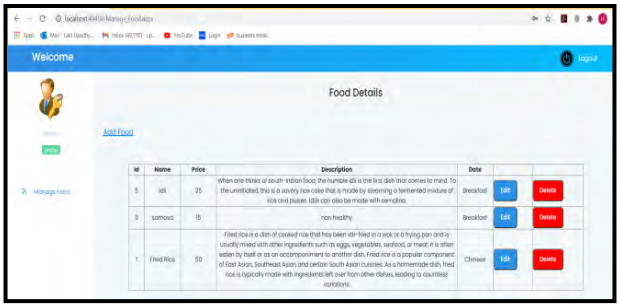


Fig.3. Manage Food page and Delete option

Fig.4. Add Food page

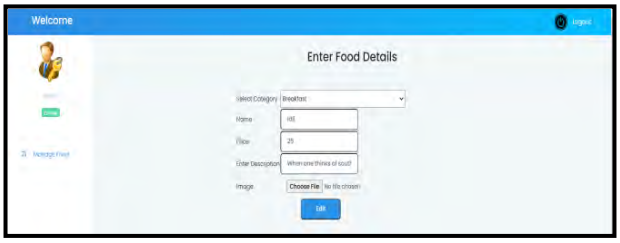


Fig.5. Edit option

Fig.6. Sign-out option

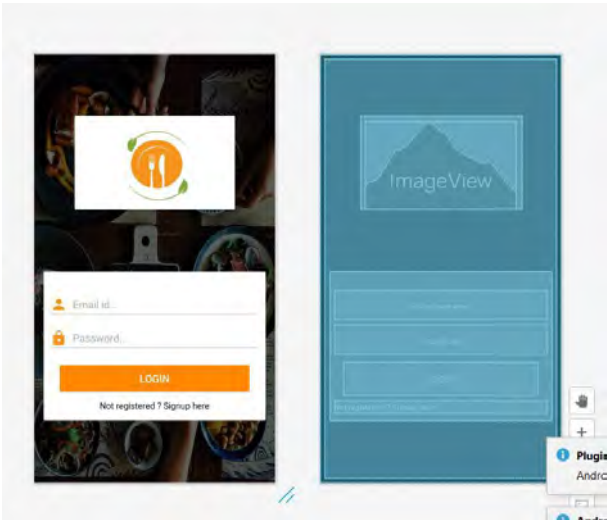


Fig.7. Login Page Design using Android Studio

IV. CONCLUSION

"Canteen Ordering System" is designed in android platform for ordering food online with the aid of recent improvements in mobile technology. This system helps the students as well as the faculty members to order food online with the help of mobiles which is convenient and feasible to all. It not only benefits the users but also the canteen admin as paper work is saved, which in turn saves time, thereby avoiding possibilities of errors. Crowding next to counters to place and collect orders would be reduced to a great extent. It will overcome traditional issues related to Canteen Management System and provide scalable and reliable Canteen Ordering.

It is an android application thus causing difficulties to the IOS users. An application useful to both android and IOS users can be implemented. This system is not user friendly for specially-abled people (blind). So, in future an application can be implemented having the voice recognition feature where the customer has to speak the names of the food items he wishes to order.

As artificial Intelligence (AI) is trending and will rule the world in the upcoming years, a system where food suggestions based on the previous food choices made by the users can be designed.

REFERENCES

[1] Sheifali Gupta, Ph.D.Shivam Gupta, Sourav Garg, Nitin Goyal, Sukhbeer Singh, "Chef Alerting System using Wireless Zigbee Technology" , International Journal of Applied Information Systems (IJAIS), Volume 6– No. 7, January 2014.

[2] B.Vinodhini, K.Abinaya, R.Roja, M.Rajeshwari, "Wireless Two-way Restaurant Ordering System via Touch Screen", The International Journal of Engineering and Science (IJES), Volume 3, Issue 7, March 2014.

[3] Mayur D. Jakhete, Piyush C. Mankar,"Implementation of Smart Restaurant with e-menu Card", International Journal of Computer Applications (0975 – 8887) Volume 119 – No.21, June 2015.

[4] Kirti Bhandge, Tejas Shinde, Dheeraj Ingale, Neeraj Solanki, Reshma Totare, "A Proposed System for Touchpad Based Food Ordering System Using Android Application", International Journal of Advanced Research in Computer Science & Technology (IJARCST), Vol. 3, Issue 1, March 2015

[5] Ashutosh Bhargave, Niranjan Jadhav, Apurva Joshi, Prachi Oke, Prof. Mr. S. R Lahane, "Digital Ordering System for Restaurant Using Android", International Journal of Scientific and Research Publications, Volume 3, Issue 4, April 2013.

[6] OP. Naiyyar. A Kher, "A Proposed System for Android based Ordering system" IJSIET publications, issue 2, 2018

[7] G. Vinod, S. Ramesh. NICE , "Menu automation with vivid monitor", issue 2010

Timing Based Medicine Dispenser using Embedded System

Neha Ghosh
Student
Department of Electronics and Telecommunication
Thakur college of Engg. & Technology
Mumbai, India
1032170449@tcetmumbai.in

Garima Jangra
Student
Department of Electronics and Telecommunication
Thakur college of Engg. & Technology
Mumbai, India
1032170467@tcetmumbai.in

Pooja Meena
Student
Department of Electronics and Telecommunication
Thakur college of Engg. & Technology
Mumbai, India
1032180705@tcetmumbai.in

***Abstract*- According to United Nations there are about 703 million people in this world which are aged 65 or above in 2019.The number of aged people are estimated to double to 1.5 billion in 2050. Old age people are more vulnerable to diseases and mental conditions. Dementia is common mental health condition occurring in old age due to combination of disease. The people suffering from this often forgot to take medicine on time and making their condition worsen. With our project we aim to resolve this issue, by proposing a system where multiple users and reminder of medicine demand will be met using these embedded based technologies. The key components are arduino Uno and RTC module. The medicine dispenser will be programmed with user specifications while programming the Arduino. It will also be using real time clock which will be programmed to show last time medicine was taken. Moreover, the dispenser will also incorporate the alarm system to remind the patient of time when patient has to be taken. The medicine dispenser proposed in this paper is different from the other proposed systems as it includes the RTC module and embedded system. Moreover, the proposed system is multiuser where earlier proposed systems were mostly single user.**

Keywords: ***Arduino Uno, embedded system, medicine dispenser, RTC module, telemedicine.***

I. INTRODUCTION

Medicine adherence is a developing worry all through the medical services industry with specialists, medical services frameworks and other stakeholders (insurance organizations) since older individuals watches out for To tackle this issue, we build up a model of pill distributor outfitted with a caution framework, with the point of a brilliant ease pill allocator with ergonomic plan particularly to the older.

The rest of the paper is organised as follows: In section II we present the literature survey. In section III, we discuss the about the working of medicine dispenser through a flow diagram. We also discussed about the main hardware components needed in medicine drug abuse by not taking prescription on schedule, underdoing, ingesting too much. They lead to numerous hundred great many genuine antagonistic medication occasions, a large number of passing's and billions of dollars in emergency clinic cost every year in only us. These disturbing insights have roused various endeavours in examination, advancement and sending of data innovation frameworks and instruments for counteraction of medicine mistakes.

As per examines, it has been discovered that dementia turns out to be more pervasive with mature age, which prompts neglecting to take meds on schedule. Numerous illnesses required a ton of drug taken at a particular time, if not done so it can deteriorate the soundness of patient. Mature age individuals have a higher propensity to neglect to take medication on schedule and it simply gets deteriorate with the expanding age. Further, populace of mature age in landmasses like Europe and Asia is biggest.

The use of pill box is a typical strategy to remind individuals about their medicine plan. The most generally utilized sort is plaid-based pill box. It is utilized to put medication with a timetable, for example, every day pill box, week by week pill box, week after week multiple times pill box and so forth In addition, pill distributor likewise encourages the patient to remind themselves to take medication on dispenser. We discuss the expected result in section IV. In section V we gave the conclusion for our work.

II. LITERATURE SURVEY

Paper published by Wissam Antoun et al., proposes a system to help the patients, Primarily Seniors, without the possibility of missing pills and also reduce the risk

of under and over dosing. It also alerts the patient to take [1] the medicine at proper time. The Hardware consists of Arduino Uno for controlling motors using PWM signals. The paper also proposes an Android Application which is built for interaction with the user regarding filling and dispensing the pills.

Another approach can be based on RFID which is used to identify the customer.Here Shraddha Kadam et al., [2] proposed system uses microcontroller AT89S52 used in the system makes the system less spatial and the circuit less complex. It is designed for users who take medications without close professional supervision

S.Mukund & N.K. Srinath proposes a system where the overall operation [5] is to facilitate the user to set the timings to dispense multiple pills at required timings. The caretaker pre-programs the AMD that allows it to set up to 21 medications does through an ergonomically designed interface, utilizing an alphanumeric keypad and LCD display.

The proposed system is composed of different modules that are controlled by PIC microcontrollers. The different modules used is either used for one way or two way communications. It is designed [3] for improving the situation by reminding the scheldule of medicine, remote monitoring and update new medicine. This system is proposed by Sagarika Lal et al.

Most of the papers which we surveyed didn't have the option of multiuser and dispatching multiple medicines. The RTC module was too not mentioned in most of them. Moreover, some were found to be not very user friendly and interactive. Our aim is to cover that gap in our work.

III. PROPOSED SYSTEM

This section describes the methodology in proposed system. The timings at which medicines has to be taken are to be programmed during arduino programming. To dispense the pills, switches would be available, when the switch is pressed it indicates which container and Stepper Motor should be rotated. Then Arduino will check the command if it starts with 'c', then it will take the next character which will be the container number to trigger the desired container. The hardware contains expandable container units. It contains 4 containerswith its own LED display. Further this system is made is made for real time users, so that user can see when was the last time medicine was dispatched.

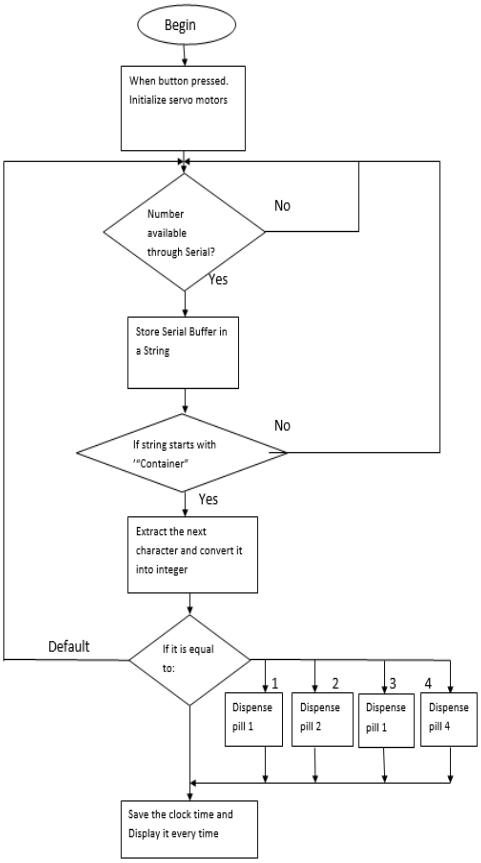


Fig1 Working of medicine dispenser

Key hardware components are:-

Arduino Uno

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter.

LCD display

An LCD is an electronic display module that uses liquid crystal to produce a visible image. The 16×2 LCD display is a very basic module commonly used in DIYs and circuits. The 16×2 translates a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 pixel matrix.

Stepper motor

A Stepper Motor or a step motor is a brushless, synchronous motor, which divides a full rotation into a number of steps. Unlike a brushless DC motor, which rotates continuously when a fixed DC voltage is applied to it, a step motor rotates in discrete step angles.

RTC chip (DS3231)

RTC means Real Time Clock. RTC modules are simply TIME and DATE remembering systems. This chip maintains seconds, minutes, hours, day, date, month, and year information. The date at the end of the month is automatically adjusted for months with fewer than 31 days, including corrections for leap year. The clock operates in either the 24-hour or 12-hour format with an AM/PM indicator.

IV. EXPECTED RESULTS

We developed a prototype model of a smart pill dispenser with alarm having RTC module. Firstly, the input part is consists of the power supply 5V, Real Time Clock (RTC) module to provide the time and date information, IR sensor to count the medicine when dispense out from the container, and button to be pressed by the user. The power supply is connected to all electronic components, except the button. Secondly, the button is consists of five buttons which are "1," "2," "3," "4" and "5" button. All buttons function as the main input for dispensing the pill from the respective container. Next, the output part consists of the liquid crystal display (LCD) to show the time and date, servo motor to open the gate to dispense the medicine, relay module to control the on and off of the circuit in the model, and vibration motor to vibrate the medicine to fall out from the container. The pill dispenser is installed with three compartments specially designed for five different types of pill. Once the button is pressed, vibration motor and IR sensor will be turned on. The vibration motor vibrates the compartment where the pills were placed earlier until the pills fall-out from the compartment to the drawer through a pipeline. IR sensor will start to count the amount of the pills fall-out based on the pills amount that have been set at the. Beginning. The process will stop once the number of pill that fall-out meet the requirement of the medication needed. When the dispensing process is complete, unless the user choose to end the system by pressing the back button, similar process will keep repeating whenever it detects the time that meet the requirement.. Using the above mentioned procedure, the developed system can be used to remind patient, especially the elderly on their medication schedule and to confirm that they take their medicine accordingly.

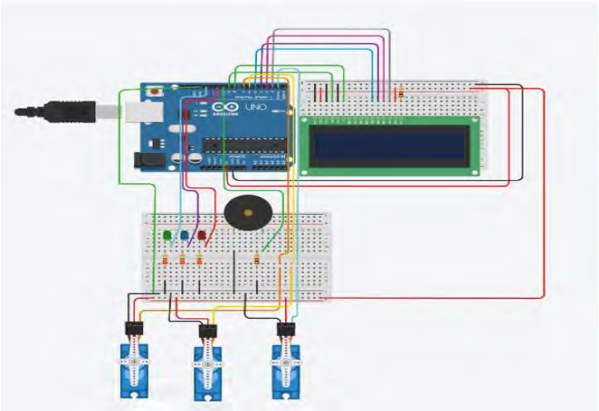


Fig 2 circuit of basic medicine dispenser

V. CONCLUSION

Most of the papers which we have seen were found to be lacking of features such as multiuser and multiple medicine dispatching. With our work we are trying to cover it. We want to make difference in health of senior citizens through our work. We have been successful in making a simulation of a base model. Base model will have additional added feature of multiuser and will dispatch multiple medicines as per requirement of user. Timings will be preprogrammed required by user. We are yet to add additional feature in our work as work is still is going on them. As it will be multiuser, it may happen timings of different user may coincide. This is another query which we are working on.

In future we wish to build an android app which will help in remote working of our medicine dispenser. We further plan to upscale our work, as our current work will have limited number of slots. We want to increase the number of slots, so that it might be helpful to more number of people.

References

[1] Wissam Antoun, Ali Abdo, Suleiman Al-Yaman, Abdallah kassem, Mustapha Hamad and Chady El-Moucary "Smart Medicine Dispenser (SMD)" .2018 IEEE 4th Middle East Conference on Biomedical Engineering (MECBME). pp 20-23, 2018

[2] Shraddha Kadam, Aishwarya Kale, Punam Nimase, Sheela Padwal, Shobhit Khandare, "Automated Medicine dispensing machine" International Journal of Technical Research and Applications e-ISSN: 2320-8163, Volume 4, Issue 3 (May-June, 2016), pp 73-76

[3] Sagarika Lal, Shivani Patil, Rahul Kumar, Prof PR Naregalkar "Smart Medical Box Using PIC Micro Controller" Journal of Emerging Technologies and Innovative Research (JETIR) and Application e-ISSN: 2349-5162, Volume 5, Issue 5(May 2018), pp 227-228

[4] Saddam Hussain, “Medical Dispense system using IoT” 2019 International Conference on Vision towards Emerging Trends in Communication and Networking (ViTECoN)

[5] S.Mukund & N.K. Srinath , “Design of automatic medication dispenser” Natarajan Meghanathan, et al. (Eds): SIPM, FCST, ITCA, WSE, ACSIT, CS & IT 06, pp. 251–257, 2012. © CS & IT-CSCP 2012, pp 251-257, 2012

[6] Suraj shinde,Nitin Bange ,Monika Kumbhar and Sneha Patil,” Smart medication dispenser” International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 6, Issue 4, April 2017,pp 200-204, 2017

[7]S. Chawla, "The autonomous pill dispenser: Mechanizing the delivery of tablet medicatio," 2016 IEEE 7th Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON), pp. 1- 4, 2016.

Intelligent Spectacles for Accident Prevention

Shrikant Sonekar, Abhishek Barve, Gaurav Habad
Gaurav Kshirsagar, Harshal Bhoyar, Kruti Sontakke

***Abstract*—as development in this era is increasing rapidly; technological advancements are becoming an integral part of humans. Road accidents are increasing every day. It can be reduced to some extent with Intelligent Spectacles. The intelligent spectacles are designed that use the deep learning approach to enhance the captured images and process only necessary information. This paper presents a brief overview of how such intelligent spectacles can be implemented with the technologies available today. Machine learning applications like Object Detection, Speech Recognition, or Web Automation can be used to build a multifunctional Intelligent Spectacle with only Accident Prevention in mind. These Spectacles are wearable devices that can interact with the user via voice, detect objects in front, keep the user updated with the latest weather or traffic updates, and help in navigation. It can reduce the accident rates and also overcome the difficulty incurred in previous glasses. We are proposing a potential direction of creating a product by combining various inputs.**

Keywords— Machine Learning, Object Detection, Speech Recognition, Web Automation, Intelligent Spectacles

I. INTRODUCTION

Road accidents do not only affect people but also the country and the effect is very worse thus it is a need to reduce road accidents. There are several reasons for road accidents some of them are very uncertain but few of them are avoidable with certain measures. In this era, technology is spreading rapidly in every aspect of life. It is because it not only makes the execution process swift but also it provides efficiency and precision for coming with the solution. In contrast to popular myths, new technologies are easily adaptable. Not because they are easy but they are convenient and resolve certain problems.

Enlisted actions sometimes cause life-threatening road accidents. Most of them can be avoided if taken into consideration:

1. Crossing Speed Limit
2. Not following rules and regulations on the road
3. Distraction (Mobile)
4. Road accidents caused due to animals
5. Condition of road
6. Low light during night time
7. High-intensity light affects the eye at night time

All the above reasons can cause road accidents so if something that can overcome such problems and help the driver while driving can be made available, it may reduce the accidents significantly. Various steps are taken to control such life- threatening incidents like speed breakers, traffic signals, road monitoring, etc. but at the end of the day, the driver needs to take an initiative and make a significant difference for this accident prevention. If technology can make an impact here, then it will bring precision, efficiency as well as comfortable and easier execution.

A user can be assisted while driving by the assistant to observe and monitor the road throughout the path traveled. It will limit the processing of information to the required one only. The assistant can warn the driver while crossing the speed limit, remind all the rules and regulation to the driver, observe and monitor the road for all type of activities, keep track of new mobile notifications and incoming calls, reduce the glare and improve the vision at night time, take care of sudden activities like animal crossing, potholes detection, respond to the user with the result, inform close contacts and a nearby hospital in case of emergency. All these activities can reduce the occurrence of road accidents.

It can be seen that similar spectacles can be seen, like Google Glass. But these smart glasses are too generalized and are very costly. In contrast, if glasses can be built with only specific problems in mind, it can reduce the cost as well as limit the heavy processing, hence making it effective. But they are the only functions for the specific feature and they are costly too. The smart helmet is designed for observing roads and obeys the traffic rules but this is not enough just like the smart helmet there is other products in the market with some limitations. While driving we need a lightweight and smart system which can be helpful to the driver in all the aspects mentioned.

It is observed that spectacles are the most usable and convenient object while driving and can be used to implement all these features effectively. A spectacle can be developed to act as a small but smart assistant for the driver who always assists and make the journey safe. This assistant can take care of traffic rules, inappropriate actions like over speeding, road signs, etc., which can also monitor road and assist with animal crossing, heavy traffic routes, bad road situation, etc., before going to any destination the assistant can inform the user, some prerequisites like weather, route, time, etc., it can keep monitoring mobile and its notifications, help in the night to detect objects in front and assist the driver at night time.

II. METHODS AND TOOLS

1. Object Detection: - Object detection is one of the important modules of a project. Object detection is done with the help of an infrared/night vision camera and python package to detect the object of similar classes. There are various algorithms in existence like Resnet, YOLO, Faster CNN, etc used for object detection. Moreover, python's package OpenCV (open source computer vision) makes it easier to work with machine learning, image processing, and object detection. OpenCV is a machine learning software library. OpenCV process images and videos to identify objects, faces, human actions, track moving objects and also the handwriting of an human being . It all can be done with the help of 2500+ optimized algorithms which include

classic and state-of-art computer vision and machine learning algorithms integrated with it. It can also extract a 3D model of the object and produce 3D point clouds from a stereo camera then stitch images together to produce a high-resolution image of an entire scene, find similar images from an image database, and recognize scenery overlay it with augmented reality. With the help of the OpenCV package, we can read, write, capture, store, filter, transform, and process images. It also performs a feature of light detection like detecting specific objects such as faces, eyes, cars, trucks, etc, in the videos and images. subtract the background data of an image and video, also track objects in it.

2. Weather Updates: - Weather update is done by using web scraping tool and python package Selenium to fetch the weather update from trustworthy webpages as per user request. Beautiful Soup, request, LXML, urllib, etc are more tools in existence that can also be used. Selenium, a web scraping tool makes it easier to work with Web Automation. Web scraping is an autonomous process where an application process the HTML and web pages to extract essential data as per user requirement. Selenium provides features like data mining, weather data monitoring more accurately than other web scraping tools. The script of selenium uses a weather forecast to fetch the forecast from genuine sources. It requires the city name to get the forecast and request for the same. The City name will be passed automatically via URL after detecting the GeoLocation of the user at the moment. Then the URL generated can access the HTML (dev) containing the content of the forecast and fetch it through the class name. Since there are more elements associated with the same class an array of elements is returned. The forecast for the required days is at the index.

3. Night Vision: - An infrared camera (IR) is used to detect objects due to its high accuracy ratings in dark. IR cameras can detect infrared energy (heat) without being in close contact with the object. Digital infrared cameras are conveniently built with a sensor that is sensitive to the IR radiation, but they are being able to detect inside energy and do not produce inside images due to infinite cut of filters that block IR light from reading the sensors and producing wired colors as a result of mixed IR and visible light. Digital infrared camera will convert detected infrared energy into electronic signals and process these heat signals to produce a corresponding and precise thermal image. The infrared camera needs long exposures even in broad daylight to allow enough time for reflected IR light to pass through. These images will be processed with the object detection module to detect objects in them.

III. OBJECTIVES

Spectacles are developed as it is the most convenient device to wear at the time of driving. To make these spectacles intelligent some features are included and are explained here. The main Objectives of the paper is to explain:

- Reducing the road accidents rates, occurred due to the disturbance of intensified headlights or reckless driving
- Providing the Navigation which will help the user to reach their destination by using voice assistance
- Providing information regarding potholes, pedestrian detection, animal crossing, and speed breakers.
- Providing information regarding the weather and traffic updates

IV. PROCESS DESCRIPTION

Detecting only necessary objects can limit the data to be processed by the user and decrease distraction. For Object Detection, the HAAR cascade classifier is used in OpenCV. Classifier sorts the data into labeled data with the help of the dataset that it is trained on, similar to supervised learning. HAAR like features are the digital image features used for Object Detection in any image. OpenCV uses edge, line, and center-surround haar-like features for object detection [referred from OpenCV Documentation]. Voice assistant is built to operate the entire device using voice commands. Major features for the aid of the user include detecting necessary objects and giving an immediate response, keeping updated with the latest news like weather and traffic info, helping with navigation, and others. Voice assistant is built using google tts and speech recognition, the python package. The main advantage of these libraries is it gives access to various pre-trained speech recognition modules like google-cloud-api, watson-developer- cloud, wit et al. Most of these speech recognition modules work on Hidden Markov Model(HMM). HMM is used to handle data and which can be represented in a series or sequence across time. It keeps track of enough past data to predict the upcoming one's in a series. Voice assistant is programmed to respond to some common queries and action related to the device and also to make generalized communication with a user as other assistants do like Siri or Alexa. If a mic catches the common set of keywords in a user's voice command like `Object Detection` or `Check Weather`, it will trigger the corresponding module to work and respond via the assistant's voice itself. In the case of Weather or

Traffic updates, Selenium, a web scraping tool is used. Selenium makes it easier to automate the majority of web browser actions. It will fetch the data related to weather and traffic around the user's location from trustworthy web sources and will give the most recurring information. Then it will respond to a user via voice. As all these modules have to be deployed on hardware, raspberry pi is used to build a working prototype. Raspberry Pi might be less effective in this scenario, as all these modules to be stored and run consecutively as per the user's demand. All these modules are deployed over the cloud and are accessed via API Calls. These API Calls are integrated with the recursive conditional loop so that the voice command will trigger its respective API call and in turn, the respective module will be triggered. After the execution of the called module, it will send the response to the source and the assistant will dictate using google-tts the user response.

V. ALGORITHM

A. Training/Development Phase Select Necessary and Efficient Models Train the models on High GPU Environment Deploy the trained models on the embedded system directly OR Deploy the trained models on server & access via REST API on embedded system

B. After Training/Deployment of Models Phase Listen to User Command using Microphone Convert it to Text using speech recognition Send the text to the API-calling function Find the best match of the text in the pre-defined set of keywords and call its corresponding Module's API Call API Call runs the module and returns the text The text gets converted to speech using google-tts Dictate the output in the pre-defined format using Microphone

The entire process is divided into 2 phases. The training phase will include data collection, its analysis, model implementation, training, and deployment. The later phase is the part of the deployment process which presents how the user will access the trained models based on various inputs and commands. The product will work on various models based on the features required. Initially, the user will give the command by voice. This voice command will be processed using Google Cloud Text-To-Speech API and then will trigger one of the models based on voice command. If the user's voice command matches the keyword set for Object Detection, the product will start the object detection model. Similarly, models like Night Vision or navigation will work. After all the processing of the model, the processed output will be dictated to the user.

VI. OBSERVATIONS & MATHEMATICAL MODEL

The Object Detection Model is tested for precision against the manually built 1000 set of labeled images to calculate the precision of the model. It is observed that the model gives a more all-rounder result at the threshold percentage of approximately 45%. At this value, the model detects the majority of the classes on which this model is trained on.

Precision Value = TP/(TP + FP)

Where:

TP – True Positive

When the model predicts the positive class correctly in an image/frame

FP – False Positive

When the model predicts the positive class but is incorrect

Table 1 Precision Observations

Calculation is based on set of 1000 images of different objects	
Threshold Value	Precision Value
In Percentage	In Percentage
95	0
90	64.56
85	58.23
80	21.93
75	36.12
70	48.38
65	55.48
60	60.64
55	62.58
50	63.22
45	**78.89**
40	69.51
35	66.45
30	67.74
25	68.38

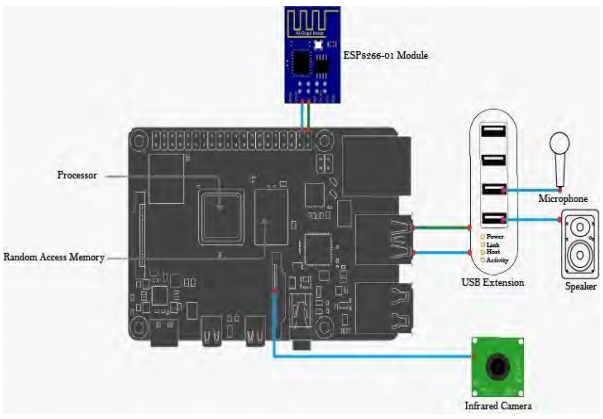


Figure 1 Circuit Diagram

VI. WORKING MODEL

Figure 1 shows the circuit diagram of the prototype built on raspberry pi and the components used. Microphone and Speaker were used for input and output functionalities. Infrared Camera for object detection is used. The Working model as shown in Figure 2 presents the overall flow of the product. The user will give a voice command which will be processed using the GMM/HMM Model. Then one of the pre-trained

models will be triggered and the inputs will be taken from the environment for processing by the camera for object detection or night vision. The final output will again be processed using GMM/HMM Model and will be dictated to the user. In figure I, OD represents the Object Detection Model and NV represents Night Vision. The voice command will be processed to identify preset keywords for selected models using speech recognition. The first model is for providing navigation instructions to the user whereas the second model is for the object detection model which will help in the detection of potholes, pedestrians, breakers, and vehicles. Model 3 will be trained for night vision and Model 4 for fetching notifications from user mobile. Model 5 will get triggered if the user exceeds the speed limit and the last one will warn before breaking any traffic rules.

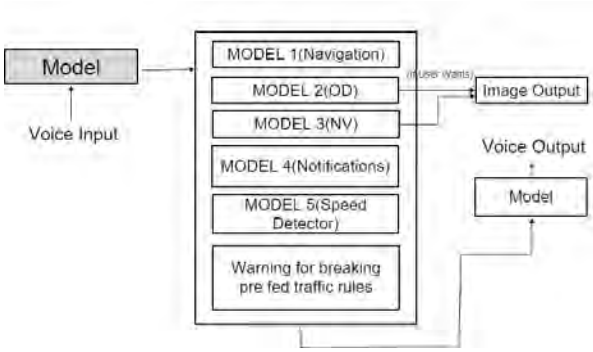


Figure 2 Overall Working Design

VII. CONCLUSION & FUTURE SCOPE

Development in the area of smart glasses is not a new one, however, in the last few years, it has seen extensive growth. According to the technical perspective, many of the advanced technologies are included in such glasses. The development of spectacles can reduce the rate of accidents. It will be helpful for people who drive daily. The technology adopted by the spectacles such as object detection, image manipulation, speech recognition, etc. will provide the necessary information to the user. Most road accidents were happened because of reckless driving and various distracting environmental factors. The spectacles can help in avoiding the road accident rates by warning about forthcoming obstacles and avoiding distractions by providing only the required information. The problems of battery consumption, high processing can be resolved with the development of upcoming technologies. Many algorithms are still being improved to increase efficiency, which can greatly help in forming an ideal product.

REFERENCES

[1] Y. Cai, X. Sun, H. Wang, L. Chen, and H. Jian, Night-Time Vehicle Detection Algorithm based on visual saliency and deep learning, Hindawi Limited Journal of Sensors, 2016, pp.1–7.

[2] T. Lin, P. Goyal, R. Girshick, K. He and P. Dollár, "Focal Loss for Dense Object Detection," in *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 42, no. 2, pp. 318-327, 1 Feb.2020.

[3] R. Raghatate, S. Rajurkar, M. Waghmare, P. Ambatkar, Night Vision Techniques and Their Applications, 2013, International Journal of Modern Engineering Research (IJMER), Vol.3, Issue.2, March-April. 2013 pp-816-820.

[4] N. Capece, U. Erra and R. Scolamiero, "Converting Night-Time Images to Day-Time Images through a Deep Learning Approach," 2017 21st International Conference Information Visualisation (IV), London, 2017, pp. 324-331.

[5] S. V. Sonekar and M. Kshirsagar, "Mitigating Packet Dropping Problem and Malicious Node Detection Mechanism in Ad Hoc Wireless Networks", in Proc. of the 4th International Conference on Frontiers in Intelligent Computing: Theory and Applications, 2015, pp. 317-328.

[6] O. Abdel-Hamid, A. Mohamed, H. Jiang, L. Deng, G. Penn and D. Yu, "Convolutional Neural Networks for Speech Recognition," in IEEE/ACM Transactions on Audio, Speech, and Language Processing, vol. 22, no. 10, pp. 1533-1545, Oct. 2014.

[7] A. E. Ok, N. A. Basoglu and T. Daim, "Exploring the design factors of smart glasses," 2015 Portland International Conference on Management of Engineering and Technology (PICMET), Portland, OR, 2015, pp. 1657-1664.

[8] P. Kłosowski, A. Dustor, J. Izydorczyk, J. Kotas, and J. Ślimok, Speech Recognition Based on Open Source Speech Processing Software. In: Kwiecień A., Gaj P., Stera P. (eds) Computer Networks. CN 2014. Communications in Computer and Information Science, vol 431. Springer, Cham

[9] L. Meile, A. Ulrich and M. Magno, "Wireless Power Transmission Powering Miniaturized Low Power IoT devices: A Revie," 2019 IEEE 8th International Workshop on Advances in Sensors and Interfaces (IWASI), Otranto, Italy, 2019, pp. 312-317.

[10] S. V. Sonekar and M. Kshirsagar, "A loom for revealing selfish and malicious node in cluster based Adhoc wireless networks," in Proc. Of the 2nd IEEE International Conference on Computing for Sustainable Global Development (INDIACom), March 2015, New Delhi, India, pp. 370-375.

[11] T. Lin, P. Dollár, R. Girshick, K. He, B. Hariharan, and S. Belongie,

[12] Feature Pyramid Networks for Object Detection, 2016

[13] Harsha S, Bhavya G. Google glass, International Journal of Advance Research, Ideas and Innovations in Technology, www.ijariit.com.

[14] J. Boksha, A. Nath, Scope and Challenges in Smart Glasses: A comprehensive study on present scenario, International Journal of Computer Sciences and Engineering, vol. 7, no. 1, pp. 619-626, Jan. 2020.

[15] U. Rehman and S. Cao, "Augmented-Reality-Based Indoor Navigation: A Comparative Analysis of Handheld Devices Versus Google Glass," in IEEE Transactions on Human-Machine Systems, vol. 47, no. 1, pp. 140-151, Feb. 2017.

[16] S. V. Sonekar, M. M. Kshirsagar, and L. Malik, "Cluster Head Selection and Malicious Node Detection in Wireless Ad Hoc Networks," Next- Generation Networks, pp. 547-554, 2018

[17] Rinna Joy, 2015, Google Glass, INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) NSRCL

[18] – 2015 (Volume 3 – Issue 28)

[19] L. Neumann, M. Karg, S. Zhang, C. Scharfenberger et al. Night owls: A pedestrians at Night Dataset, Asian Conference on Computer Vision, 2018.

[20] S. Mannor, D. Peleg, R. Rubinstein, The Cross-Entropy method for Classification Machine Learning, Association for Computing Machinery, pp. 561-568, 2005.

Voice of the Speechless using Raspberry Pi

Ujala Pandey
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India.
ujalaspandey@gmail.com

Deeksha P. Sharma
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India.
sdeeksha906@gmail.com

Shivam Singh
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India.
singhshivam71196@gmail.com

***Abstract*— It is difficult for the normal people to communicate and interact easily with the deaf. Sign language is a communication among the deaf themselves and the normal but their gestures is not understood by the majority of people. So this is our attempt to design a software based system for conversion of sign language to voice. The sign language is the basic communication method for the deaf and the software will be designed for a real time sign language recognition system. This software will be able to capture the actions performed by the user. A sign language recognition system is essential to utilize the details from both global attributes, being the hand movement and location and the local features likely hand shape and orientation. This project will be constructed using Raspberry Pi as the base for all the working purpose with the help of Python as the programming language and Pi camera will be assisted for capturing the video frames. The Open CV is an Open Source Computer Vision Library which supports Python computing language. It is a library of programming functions chiefly aimed toward time period pc vision. Image process could be a methodology to perform some operations on a picture and Python is a widely used general-purpose, high-level programming language. The project will be able to grant voice to each gesture and every action.**

Keywords*— *Sign Language recognition system, Raspberry Pi, Python, Hand Region Segmentation, Hand Detection and tracking, Hand Posture Recognition, Classified Gesture, Display as text and voice.

I. INTRODUCTION

In the modern world, we have all the latest equipment's available to make our lives easier and better. But the advancement in the technology has had a bad effect on the different environmental and physical aspects involved in its development. Considering the Sign Language Software Application, we know that the few of these applications that are available now-a-days are able to convert on text or voice to sign language only. The problem is to assist the normal people in understanding the sign language of the deaf and the dumb for ease in conversation. Hence, to overcome all the flaws in the current software applications, we plan to create such an application that is user friendly and convenient to use. As most of the people are not able to understand the sign language and are not able to communicate efficiently and easily with the deaf and the dumb people. This is our attempt to create a convenient flow of communication with them. The current sign language software applications used have many advantages, but at the same time it has a number of disadvantages too. The following is the list of the few disadvantages that are faced in the because of the use of the current sign language software applications. Many Sign Language software applications are a one way communication medium, as only the user can convey his/her thoughts to the deaf but not the vice versa. A normal person will not be easily able to understand the sign language performed by the deaf even with the help of the application, as every action has to be typed. To display a specific sign language the user needs to type everything. There may or may not be a voice command option due to which there is to lot of time consumption. There are many software applications that show incorrect translations of the sign language. Some Indian Sign Language software applications use American Sign Language to display some words. Our project basically focuses on the parameters that help us to improve the quality of the software application. The following are the some of the basics areas where our project is trying to improve the efficiency of the application. Two ways communication is the main focus of our project is to establish a two way communication between the user and the deaf. This will be done by giving voice to the actions performed by the deaf. This project will help with the real time conversion of sign language to voice and vice versa.

II. LITERATURE SURVEY

The sign language is read from multiple video objects by segmentations and tracking and scanning of the gestures is based on the skin color, texture, boundary and shape. Also feature vector is used train the artificial neural network, the network outputs and determine the voice command relevant to the trained sign. This paper summarizes various algorithms used to design a sign language recognition system. It focused more on a real time sign language recognition system. Here there is an issue with the background where the person is standing as there may be the cluster. The sign language is read from multiple video objects. There are restricted sets or restricted number of members, resulting different problems in sign language feature extraction. With increase in applications researchers should emphasis on the development of a well suited segmentation scheme which is capable of extracting the hand and face region from videos/images having any background. [1]. An another similar project presents a method of automatic

recognition system of static gestures in Indian and American sign languages alphabet and numbers. The sign considered for recognition are British Sign Language (BSL), Indian Sign Language (ISL), 26 letters alphabets and the 0-9 numbers. American Sign Language (ASL), etc. are some of the common sign languages in the world. The Indian Sign Language (ISL) is double handed and hence it is more intricate compare to single handed American Sign Language (ASL). Sign language recognition system typically elaborate three steps pre-processing, feature extraction and classification [2]. A research paper represent works on design and implementation of the automatic image collection for petrol watch. To design automatic image collection for Petrol Watch when the vehicle is within a distance range it will be detected by GPS or GIS information. To capture image camera is automatically triggered and it will accelerometer is triggered for post-processing of image. To deal with blurred images caused by vehicle vibrations, they have designed a set of pre-selection thresholds based on the measures from embedded accelerometer of the mobile phone [3]. A parallel project represents about the Gesture based voice and language translator for dumb people. Gesture is a movement of part of the body, especially a hand or the head, to express an idea or meaning. This paper proposes a system that converts gestures given by the user in the form of English alphabets into corresponding voice and translates this English voice output into Microsoft supported languages. The system consists of MPU6050for sensing gestures movement, Raspberry pi for processing, and a speaker. Raspberry pi generates voice output for the text in multiple languages using voice RSS and Microsoft translator [4]. Improvement of user independent systems which could recognize signs from both facial and hand gestures is a major challenge in the area of sign language recognition. And in case of petrol watch Future work mainly focus on dealing with the major challenges related to automatic image quality images‟ collection for Petrol Watch to enhance the quality of image. For gesture based voice and language translator emphasis should laid down developed for recognizing symbol rather than alphabets. Microsoft translator and voice RSS supports limited languages can be added by creating corresponding databases.

III. ALGORITHM

1. Capture video using open-cv.
2. Define region of interest where we will have to
3. detect gesture of hand.
4. Then we will convert BGR colours to HSV.
5. Define range of skin colours and rest will be eliminated from the frame.
6. The extracted image will be visible in mask and blurred image for removing the noise.
7. Find the contour to make a convex hull around the hand, by defining area of hull and area of hand.
8. Find the percentage of area covered by hand in convex hull, which is given as :-

$$\frac{\text{Area of hull} - \text{Area of hand}}{\text{Area of hull}}$$

9. Then we will find the defects which are regions which is not covered by our hand in convex hull. This will be done by detecting the angles which are greater than or less than 90°. The angles will be identified using cosine rule, ignoring the angles which are greater than 90° and ignoring the points which are close to each other approx 30°.
10. Now we will print the corresponding gestures which are in their corresponding ranges.
11. For defect(l=1):
12. If the area of hand will be less than 2000 it will be printing put the hand in the box.
13. Else if the percentage of area covered by hand is less than 12, it will print text as „0‟.
14. Else if the percentage of area not covered by hand is less than 17.5, it will print text as „Best of Luck‟. Or else it will print text as „1‟.
15. If the defects are 2(l=2), the text printed will be „2‟.
16. If the defects are 3(l=3):
17. It will first observe the percentage of area covered by hand, if it is less than 27 it will print „3‟. Else it is going to print „OK‟.
18. If the defects are 4 (l=4), the text will be „4‟ and for 5 (l=5) it will print „5‟.

IV. PROPOSING METHODOLGY

The expected methodology is to first procure the video frames that will be captured by the Pi camera. From the collection of the frames, the hand and the head region will be segmented so as to understand the words enacted by the user. The segmented region will be detected and tracked for recognizing the hand and the head posture. Once the gesture is classified it will be pronounced out loud as the output. For capturing the image of the signer Pi camera will be used. The sign language shown by the person will be captured using Pi camera which is a compatible device with Raspberry Pi. This camera is capable of capturing a sequence of images extremely rapidly by utilizing its video-capture which will capture the fixed number of frames like burst of 5 images will be captured and sent for Hand region segmentation. The main purpose of the hand segmentation is to chop off the users hand from the background within the frame. The task of hand region Separating and grouping pixels that square measure followed is simplified by the top quality flick captured for many stop motion animations. The background scenes shot will be eliminated by using median filtering in time domain. The background subtraction will be done by segmentation of the hand and head of the person and the gesture shown will be detected.

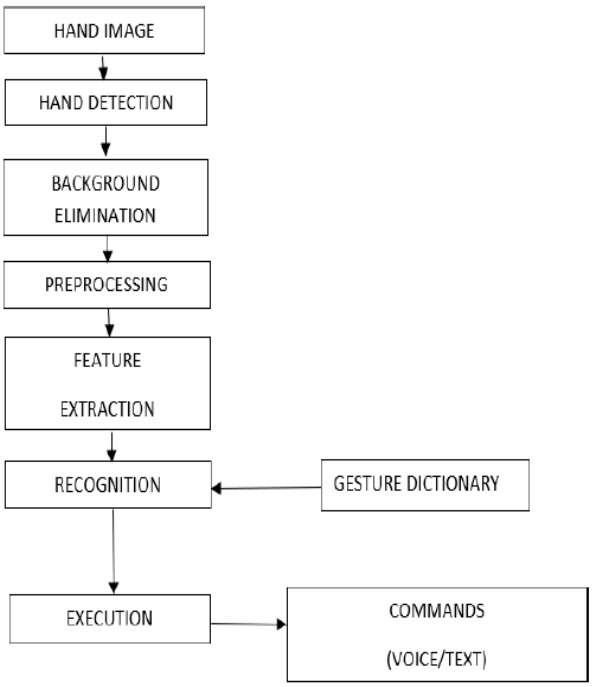


Figure 1. Flow Diagram

For the detection and real time recognition purpose the OpenCV library will be installed which is been widely used for the image processing due to its inbuilt DNN (Deep Neural Network) module. OpenCV is capable to detect and recognize a large variety of objects, but our main focus will be to apply techniques and methods to detect and recognize the gestures of the human hand. The skin color detection is one of the most popular ways to detect the gesture shown by the person. Another method does not use the color of the hand; it uses convexity detection of OpenCV, this method will use the exterior shape of the hand to detect the gesture. Once the gesture of the dumb person is identified it will match with the existing gesture information. Then the identified gesture will be converted to the text. The converted text will then be further processed through a separate algorithm to convert that into the voice command. This voice command will be audible by the normal person through the speakers.

IV. Result and Discussion

In our project voice of the speechless using Raspberry-pi we have included total of seven gestures‟ from which the first five are the numbers which are 1,2,3,4 &5 and rest two are the “OK” and “BEST OF LUCK”. This is achieved by extracting the background first and then filtering out our skin tone. Then the different angle‟s between the fingers are identified and used for recognizing a particular gesture. The accuracy of this project will be irrespective of the background color which will be very helpful in converting the gestures for the deaf and dumb people to communicate.

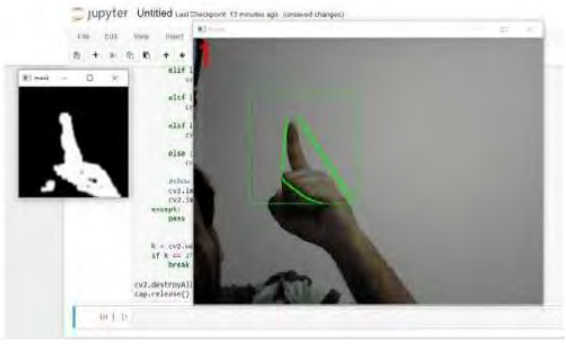


Figure 2. Number 1

In the above figure 2 we have identified gesture representing number 1. In this identification we have formed the convex hull around the hand by recognizing it‟s colour this convex hull is used to measure the distance and shape of finger and hand to detect the gesture.

Figure 3. Best of Luck

In this figure 3 we have detected the gesture which identified as “Best of luck”. In this gesture the convex is used to identify the thumb and the four fingers which are curled around the wrist to form the shape.

V. CONCLUSION

In today’s world the biggest problem for the speechless person is to communicate with the person who doesn’t knows the sign language, moreover there are various types of sign languages around the world which makes more complication while communication. This project is proposed to overcome this issue by recognizing the gestures and converting that gesture into a voice command which can be easily understood by the person. We had used several libraries of python like open-cv, numpy & math just for the detection of gestures shown in the ROI (Region of Interest)

This project will be designed for sign language recognition system that performs well under natural backgrounds and there is an attempt to improve the focus and clarity of the image. It is to be designed to work even in adverse environment. There is an attempt to insert a maximum possible number of signs and to apply this technique to continuous signing recognition systems to hold out the popularity in real time. The

software will be portable, compatible, easy and efficient to use.by using the Jupiter notebook.

VI.FUTURE SCOPE

The scope of this project is to help the normal people to understand and communicate conveniently to the deaf and the dumb people. This will be of a great help for everyone to understand each other in a better way. The future scope of this project is to modify the software by making a two-way communication, that is, sign language to voice and vice-versa. Also it will be an attempt to convert the sign language to various languages. Another modification that can be carried out is that it will be able to understand Indian as well as foreign sign languages.

1. To convert sign languages to various languages.
2. To understand Indian as well as Foreign sign languages.
3. To make it more user friendly and less expensive so that it can be easily available.
4. To insert a maximum possible number of signs.

ACKNOWLEDGMENT

The authors would like to thank the Principal, the management and the faculties of the Thakur College of Engineering and Technology for their continued support in carrying out this project and in publishing this paper at the conference.

REFERENCES

[1] P.V.V Kishore and P. Rajesh Kumar "Segment, Track, Extract, Recognize and Convert Sign Language Videos to Voice/Text" (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 3, No.6, 2012.

[2] Imagawa I et. Al, "Recognition of local features for camera-based sign language recognition system", Proc. ICPR"00, pp849-853, 2000.

[3] Yi Fei Dong, Salil Kanhere, Chun Tung Chou and Ren Ping Liu "Automatic image capturing and processing for Petrol Watch" IEEE International Conference on Networks, Singapore, December 14-16, 2011, DOI: 10.1190/ICON.2011.6168481.

[4] L. Anusha and Y. Usha Devi "Implementation of gesture based voice and language translator for dumb people" (ICCES) International Conference on Communication and Electronics Systems, Coimbatore, India, October 21-22, 2016, DOI: 10.1190/CESYS.2016.7889990.

[5] T. Kirishima, K. Sato and K. Chihara "Real-time gesture recognition by learning and selective control of visual interest points" IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 27, No. 3, March 2005.

[6] P.V.V Kishore, P. Rajesh, E. Kiran Kumar & S.R.C. Kishore, "Voice Audio Interference for Recognizing Gesture of Indian Sign Language" International Journal of Image Processing (IJIP) CSC Journals, Vol. 5, No.4, pp479-503, Sep 2011.

[7] Yang M, Ahuja N, "Recognizing hand gesture using motion trajectories", CVPR"99, pp892-897, 1999.

[8] C. Vogler and D. Metaxas, "A Framework for Recognizing the Simultaneous Aspects of American Sign Language". Computer Vision & Image Understanding, 81(3): 358-384, March 2001.

[9] Ravikiran J, Kavi Mahesh, Suhas Mahishi, Dheeraj R, Sudheender S, and Nitin V Pujari, "Finger Detection for Sign Language Recognition", Proceedings of the International MultiConference of Engineers and Computer Scientists (IMECS 2009), Vol. 1, Hong Kong, March 2009.

[10] Ginmo Chung and Luminita Vese. (2003) "Image segmentation using a multilayer level set approach Techniacal Report", 03-53, UCLA.

[11] L. Brkthes, P. Menezes, E. Lerasle and J. Havet, "Face tracking and hand gesture recognition for human-robot interaction", Pmcwdingr of the 2004 IEEE International Conference on RobotIco 6 Automation New Orleans. April 2004.

[12] Birirk. H., Moeslund, T. B., & Madsen, C. B. (1997). Real-time recognition of hand alphabet gestures using principal component analysis. In Proceedings of the 10th Scandinavian conference on image analysis.

[13] Neelam K. Gilorkar, Manisha M. Ingle, "A Review on Feature Extraction for Indian and American Sign Language", Neelam K. Gilorkar, et al, (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5(1), 2014, 314.

Towards A Healthier Future Using Smart Oven App

Anjali Jha
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
anjalirjha@gmail.com

Sachin Mishra
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
sachin19566@gmail.com

Vijayshankar Mishra
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
vijaymanojmishra@gmail.com

***Abstract*—Smart appliances are becoming popular in today's smart world. More number of people are investing in the smart kitchen appliances as they will be used to reduce the time spent in kitchen and make the kitchen work hassle free for almost throughout their lifetime. Hence, many manufacturers are focusing to making these appliances more interesting and loaded with fuzzy logic. However, majority of manufacturers focus on how to make them faster and very few pay focus on the user need, experience along with their health. We are introducing a solution for oven which is designed keeping in mind the user experience and keep a watch on health of users. This project aims to highlight the various aspects of IoT and its role in Smart Oven APP. "Smart Oven APP" is going to cover various technologies like Android App development, Machine learning, Speech processing, Cloud computing and Internet of things. Our Android APP will be able to control the oven settings remotely. Use of machine learning algorithms made it simpler to suggest diet plans and nutrition plans to the user. Also, users will be using the android app to give instructions to the oven, which will be converted into voice message for the user at home**

Keywords— Android App Development, Android Studio, Health Monitoring System, Internet of Things (IOT), Linear Regression, Machine Learning, NodeMCU.

I. INTRODUCTION

Kitchen is the exceptional spot, called the primary centre point or the core of the home or inn ventures. It is where one of the fundamental necessities for example food is readied. It is the regular focus of social exercises of all the relatives who share their sentiments or feelings. By referring different research papers, we found that many manufacturers are focusing to making these appliances more interesting and loaded with fuzzy logic. However, majority of manufacturers focus on how to make them faster and very few pay focus on the user need, experience along with their health.

There are so many apps and websites which interact with user and suggest them different recipe, but they are not directly interacting with oven therefore in this paper we are going to introduce an app which interacts with user as well as with the oven to make the better ecosystem. The app is essentially use to control the oven remotely. Also, the app is going to suggest different types of recipes and diet plan suggestions according to user data using machine learning (linear regression) Algorithm.

To storing the data and updating it in real time we are going to use google firebase as our cloud service. We use cloud not only to store data but also for data analysis, gathering, visualization. Such an emerging technology can be used in various IoT applications like agriculture, health, smart home etc. to make the already existing systems more efficient. The key characteristics of the cloud include on-demand service provision, ubiquitous access, resource pooling and, elasticity.

The NodeMCU is a very cost effective and low power, Wi-Fi-based microcontroller. This data is subscribed by the Arduino. Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices. Arduino receives the sensor data from different devices located at different locations and sends alerts to the user registered phone number and also alerts by means of alarm through live data on firebase platform.

The rest of the paper is organized as follows: In section II we present the literature survey. In section III, we discuss the gap analysis. In section IV, we proposed the methodology of our system model. In section V, we mentioned the results of simulation of our app. In section VI, we provided the conclusion of our work.

II. LITERATURE SURVEY

By Analyzing several research papers on Smart Oven, we found some of the work in the smart oven done by the earlier authors and some gaps in their papers. RamaiYa red And Beassam Abdulrazak they have done the work on various sensors which should be integrated with the oven to enhance cooking safety [1]. The research gap in this paper was they are not able to give a better user experience although they are meeting the criteria of cooking safety. So, we thought of providing a remote control of the oven to increase user experience. Bojun Li, PiyanuchHathaiponataluk, SuhaniLuo they were trying to introduce an innovative intelligent oven

for the healthier food choice [2]. The research gap in this paper was they were trying to do this on the oven itself and this will make the system bulky so we thought to introduce an android app to recommend a healthy recipe, diet plan for the user. Ansari, Kartik Gupta, Manasvi Bhargava, Lakshita Verma they were trying to develop a microwave oven that has ability to hear the user and fetch instructions using voice command apart from its usual way of getting way of commands from the Keypad [3]. We as the author of this paper found this idea great and included this in our future work which will also be done to the same android app only.

By referring different research papers, we found that many manufacturers are focusing on making these appliances more interesting and loaded with fuzzy logic. However, the majority of manufacturers focus on how to make them faster and very few pay focus on the user's need, experience along with their health. There are so many apps and websites which interact with users and suggest different recipes, but they are not directly interacting with the oven. So, we are trying to make an ecosystem where users can interact with our app and can control the oven remotely and through the app, he/she gets notifications for his diet plan according to the data fed in the app.

II. PROPOSED SYSTEM

In this Proposed System by incorporating the application with oven where client will collaborate through application and subsequently the application will recommend the eating regimen plan to the client as per their own information filled. Hence, our proposed a framework will tackle the previously mentioned issue. We are going to develop an android app which will be able to control the oven remotely. Also, the app is going to suggest different types of recipe and diet plan according to the user's data using Machine learning

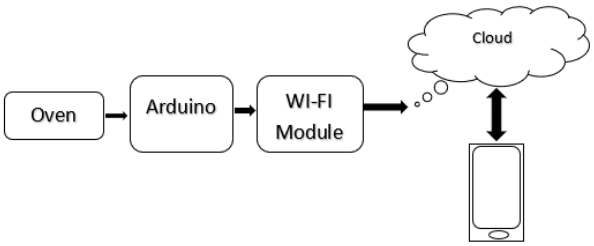


Figure 1: Proposed System

(Linear Regression Algorithm). "Smart Oven App" is going to cover various technologies like android app development, Machine learning, Cloud Computing and Internet Of things. We are going to use Arduino UNO as a controller for the various kinds of signal processing from the app to the oven.

Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices. Arduino receives the sensor data from different devices located at different locations and sends alerts to the user registered phone number and also alerts by means of alarm through live data on firebase platform.

NodeMCU is an open-source firmware and development kit that helps you to prototype or build IoT products. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espress if Systems, and hardware which is based on the ESP-12 module. The firmware uses the Lua scripting language. It is based on the eLua project and built on the Espress if

Figure 2: Arduino Uno Image Source: Adapted From

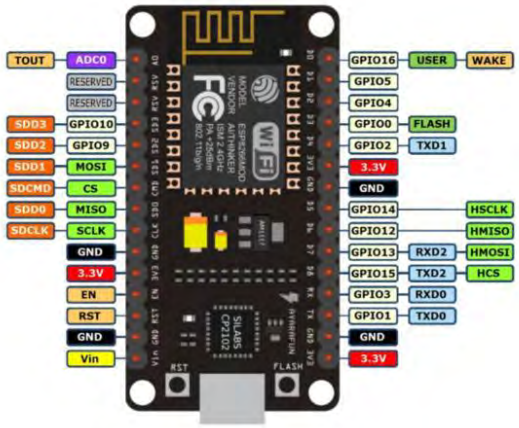


Figure 3: Wi-Fi Module (ESP 8266) Source: Adapted From

Non-OS SDK for ESP8266. So, we are going to use Node MCU for the Wi-Fi purpose and also it is going to connect with the google firebase which we are using as our database. Firebase is a platform developed by Google for creating mobile and web applications. The below table shows the total estimated cost of our proposed system. As in our System we are going to use Arduino uno and ESp8266 Wi-Fi Module so the estimated cost of our design is shown below in terms of table form.

Table 1: Estimated Design Cost

Project	Quantity	Price
Arduino	1	1,400
NodeMCU (ESP8266)	1	420
Total		1,820

In the below Figure 4: Proposed System Flowchart, flow chart shows the entire functioning of our android app i.e., Smart Oven App. Firstly it will ask the user for an account, If the user does not have any account, he should signup first then the user can login. If the user has an account, they can login directly after login our app will ask to submit some personal details of the user like Name, Age, Height, Weight, Any Food Allergy, etc. The user's data will be stored in our database and can be used further for suggesting healthier diet plans. After finishing this user will be able to see the control panel of the oven. Along with the user mode, oven mode and food mode. In user mode the user can select the different combinations like weight gain or weight loss or a normal diet. According to the chosen option a healthier diet plan will be recommended by our App.

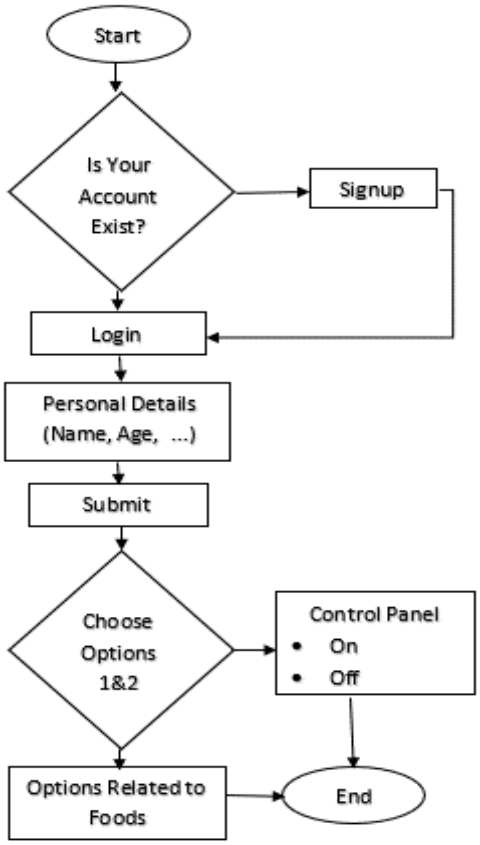


Figure 4: Proposed System Flowchart

In Figure 5. User Application Flow of Smart Oven App, the user interface with Application Flow chart is given in which the user has to registered herself/himself and have to fill their data as personal details which will be stored in our database through which we will be suggesting the user their diet plan and exercise. Next is the user mode in which there is three options i.e., Weight gain, Weight loss and normal and according to the user selection the diet plan will be discussed with them on our app.

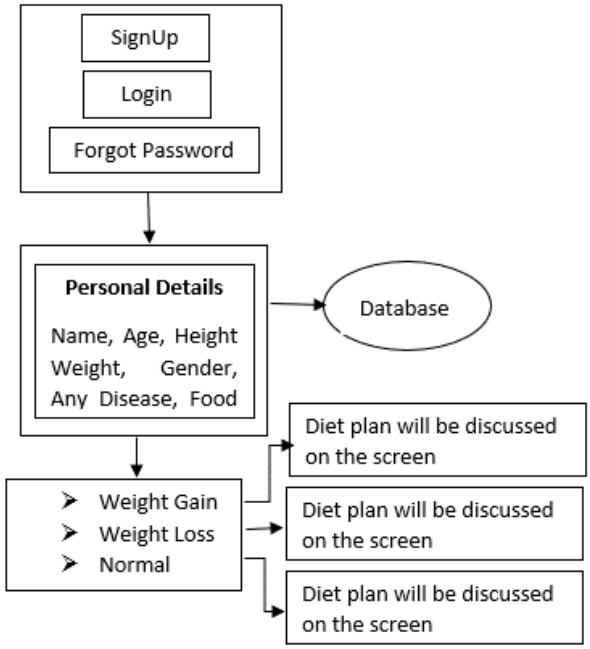


Figure 5: User Application Flow of Smart Oven App

IV. RESULTS

The app which we are developing with the help of android studio application is having many steps or processes for the users

1) Logo page

In this page the user can see an oven image and "SMART OVEN" written on it. By which user can recognize is something about oven, food, health, etc.

Figure 7: Logo Page

Figure 8: Login Page

2) Login page

In this page the user has to enter his phone number to login if they have already registered to this app and if he is new to this app then they have to click on new user and then have to come to register page.

Figure 9: Registration page

3) Registration page

Here user will have to register first if he/she do not have an account and by registration he/she is able to proceed towards our smart oven app.

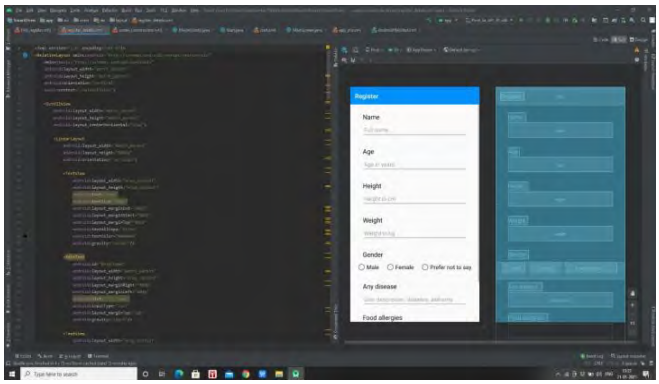


Figure 10: User Details page

4) Details page

Here user will fill his details like name, age, weight, height, gender, any disease, any food allergy. And this will store in our database. As per the user's data our system is going to suggest the

Figure 11: Modes of oven

5) Modes of oven

Here we can see 3 modes i.e., user mode, oven mode, food mode. And can set or reset the timings and

temperatures according to user's choice. Here the user are able to
6) User mode

Here user will get three choices weight gain, weight loss and Normal mode. User can choose any of one according to their choice and need. As per the user choice the system is going to give diet plan.

Figure 12: User Modes

7) Oven mode

Here user can select in which mode he wants to cook the food. We have provided 4 choices grill, bake, heat, cook. In oven mode the user can bake, grill, heat or cook from home or office.

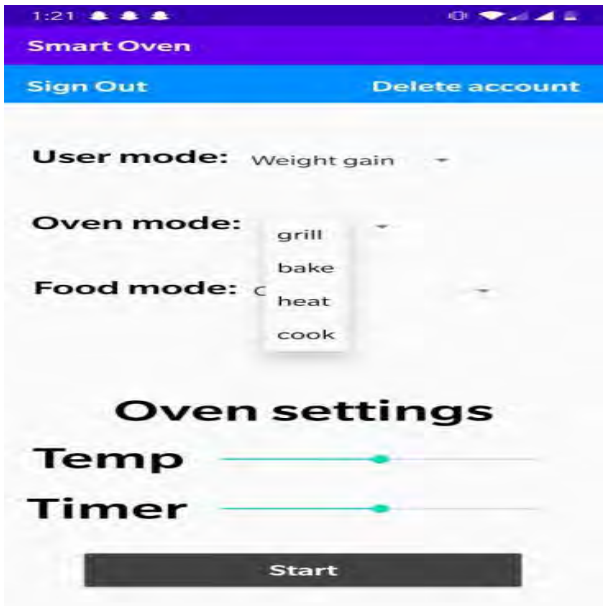


Figure 13: Oven Mode

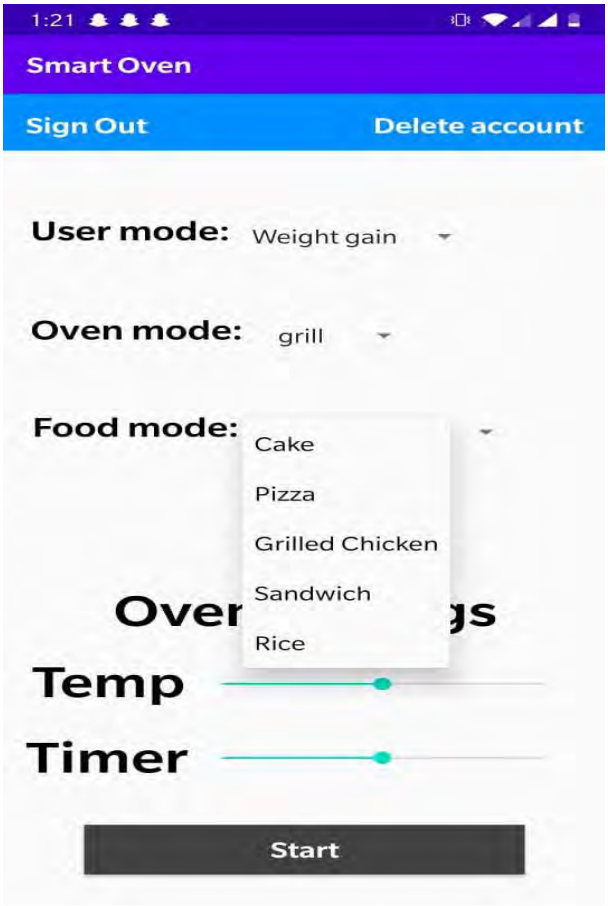


Figure 14: Food Mode

8) Food mode

Here user can select a food mode which will have pre-defined settings of the food to be cooked and will adjust their time automatically by one click. We have given five choices. Cake, pizza, grilled chicken, rice, sandwich.

V. CONCLUSION

By referring different papers, we have identified some research gaps like many manufacturers focus on how to make oven faster in cooking and very few focuses on user experience along with their health. We have introduced a healthier smart oven app. Our smart oven app is capable to operate the oven remotely as well as it will suggest healthier diet plan to the users. Till now we have built some pages of the application like login page, user details page, different modes (oven mode, user mode, food mode, etc). also, we have performed linear regression to suggest diet plans for the user but we need to integrate it in smart oven app. There are still some areas that can be improved for the system in future. We are planning to add some extra features in our app like user can edit(update) his/her daily consumption of food and depending on that data "smart oven" app will suggest them much better nutrition plan. Also, by analysing that data our app will be able to give daily notification to achieve user's goal.

REFERENCE

[1] RamiYared And BeassamAbdulrazak "Sensor based Smarty oven System to Enhance Cooking Safety*", Department of Computer Science, University of Sherbrooke, 2500 boul. de l'Université, Sherbrooke J1K 2R1, QC, Canada Presented at the 3rd International Electronic Conference on Sensors and Applications, November 2016*J.

[2] Bojun Li, PiyanuchHathaiponataluk, SuhaniLuo "Intelligent Oven in Smart Home Environment", 2009 International Conference on Research Challenges in Computer Science, University of Newcastle, Callaghan NSW 2308

[3] Ghazala Ansari, Kartik Gupta, Manasvi Bhargava, Lakshita Verma "IOT BASED VOICEROWAVE OVEN", *ISSN 2277-2685 IJESR/March 2018/ Vol-8/Issue-3/38-41 Ghazala Ansari et. al., / International Journal of Engineering & Science Research*

[4] "Arduino Uno." *Arduino Uno REV3 Arduino Official Store*, Arduino Official Store, store.arduino.cc/usa/arduino-uno-rev3.

[5] "ESP8266 NodeMCU." ESP8266 NodeMCU, ESP8266 NodeMCU, store.NodeMCU ESP8266.cc/usa/arduino-uno-rev3.

[6] Mirko Stojiljkovic "Linear Regession in Python" RealPython [Online]. Available: https://realpython.com/linear-regression-in-python/

[7] Code with Harry, "Linear Regression code in python sklearn!-Machine Learning Tutorials", Online].Available:https://www.youtube.com/watch?v=pfmJtWEMEpo&feature=youtu.be

[8] Tutorial With Project, "Linear Regression With Project #MLTutorials #Sales Estimator" Feb 12, 2020 [Online]. Available: https://www.youtube.com/watch?v=ZPPiZvvpU6s&feature=youtu.be

[9] Olamide jegede, "Coven: A case study of a smart oven app" , codebrust, May 10,2019.
[Online]. Available : https://codeburst.io/noven-a-case-study-of-a-smart-oven-app-c75f05e6cc5e

[10] "Android Tutorial – Tutorial Points", [Online] Available: https://www.tutorialspoint.com/android/index.htm

Smart Gas Sensor for LPG Leakage Detection

Suraj Pal
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
surajpal.tcet@gmail.com

Sagar Patel
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
sagarpatel1999@gmail.com

Neel Shah
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
shahneeldivyesh@gmail.com

***Abstract*—A major problem in industries and residential complexes is the leakage of gas. Many accidents and loss of lives and property has taken place because of gas leakage and the results of that leakage. One of the preventive methods to stop accidents associated with gas leakage is to install a gas leakage detection kit at vulnerable places. There are some devices in the market, which do this job, but currently, available leakage detectors warn using on-site alarms. There are no facilities to warn people, which are off-site. This project proposes a leakage detector, which not only will send the warning to the concerned people on site but also offsite through SMS. Besides, the current location will be sent to the fire department using GPS. In addition, different colour LEDs will be used to specify the amount of gas leaked. Continuous monitoring of surrounding temperature will be done by adding a temperature sensor, as some gases are flammable after a certain temperature so it is essential to know the temperature. The relay will also be there so that if the leakage crosses the threshold main power supply can be switched OFF automatically to avoid any fire accident due to a short circuit. This proposed system will provide a safe, secure way for avoiding accidents. By implementing this modern gas detection system in actual practice, cannot only give more Benefits but also, can bring the safety system towards global standards.**

***Keywords*—Gas leakage, detection, LPG, GSM.**

I. INTRODUCTION

Gas leakage is a serious problem and nowadays it is observed in many places like residences, industries, and vehicles like Compressed Natural Gas (CNG), buses, cars, etc. It is noticed that due to gas leakage, dangerous accidents occur. The Liquefied petroleum gas (LPG), or propane, is a flammable mixture of hydrocarbon gases used as fuel in many applications like homes, hostels, industries, automobiles, and vehicles because of its desirable properties which include high calorific value, less smoke which harm the environment. Liquid petroleum gas (LPG) is highly inflammable and can burn even at some distance from the source of leakage. This energy source is primarily composed of propane and butane, which are highly flammable chemical compounds. In homes, mainly LPG is used for cooking purposes. When a leak occurs, the leaked gases may lead to an explosion. Gas leakage leads to various accidents resulting in both material loss and human injuries. Home fires have been occurring frequently and the threat to human lives and properties has been growing in recent years. The risks of explosion, fire, suffocation depends on their physical properties such as toxicity, flammability, etc. The number of deaths due to the explosion of gas cylinders has been increasing in recent years. The Bhopal gas tragedy is an example of accidents due to gas leakage. Therefore; the gas leakage should be detected and controlled to protect people from danger. A gas leakage detector becomes vital and helps to protect people from the dangers of gas leakage. In this paper, the user gets an alert notification about the gas leakage through SMS, which contains the amount of gas in percent. In addition, the location of the site will be sent to the fire station and user using the GPS module if gas leakage exceeds 50% and the relay will disconnect the main power supply.

II LITERATURE REVIEW

This system is not taking any measures to reduce the chances of an accident. In the present world, there is a need for a system that not only detects the leakage but also alerts the user before any further damage, which may lead to a huge loss. There is also a need to cut-off the main power supply. This system can be improved by using a relay, which is connected to the main power supply, and if the leakage exceeds a threshold value, the main power supply will be disconnected [1]. This system uses three gas sensors for different gases to sense the gas and alert if the amount of gas crosses the threshold value, but although it gives alert notification there is a need for a display so that the continuous monitoring of the gas leaked and temperature. This system can be improved by using LCD and LED's for displaying and indicating the different percentage of gas leaked [2] This system uses the gas sensor and notifies the user using the LCD, which is installed on-site. So, an alert notification system is needed to notify the user if there is no one on-site during the leak. Besides, the fire departments need to be notified if in case there is a fire breakout. As the weight sensor detects a sudden change in the weight of the container, so if there is a small leak this system will fail to detect it as the containers in industries are intones. Hence, this system is not suitable for industries. This system can be improved by using a GSM module to give an alert notification to the user as well as to the fire department [3]. This system senses the leakage of gas, alerts by displaying on LCD, and sends an alert message to the registered mobile number using a Wi-Fi modem. Wi-Fi is not very reliable, especially for safety systems. In this case, a Wi-Fi modem is used to send the alert notifications but there are many drawbacks of using Wi-Fi as a default source for communications such as

internet problems, and also user should have an internet connection to receive the alert notification. This system can be further improved by using a GSM module for sending alert SMS. In addition to that, the system can include the GPS module for sending the exact location [4]. This system has a gas sensor for gas leakage detection but does not include a temperature sensor because certain gas at a certain concentration might not be flammable at low temperature but might have explosives at high temperature. For this reason, the addition of a temperature will be very helpful. This system can be further improved by having a temperature sensor for continuous temperature monitoring and displaying the same, information using an LCD [5].

III GAP ANALYSIS

After analysing all the above papers, it is clear that there exist some devices for this purpose but every device is missing some of the other features, which are essential for maximum safety. Features like not taking any measures after the gas will leak, not specifying the amount of gas leaked in the air, not providing an alert notification, not measuring the surrounding temperature. The above-mentioned research gaps will be overcome in the proposed project. The proposed project will be using a relay, which is connected to the main power supply, and if the leakage exceeds a threshold value, the main power supply will be disconnected. It will also be using LCD and LED's for displaying and indicating the different percentages of gas leaked. The proposed system will be using a GSM module to give an alert notification to the user as well as to the fire department. Also, a temperature sensor will be added for continuous temperature monitoring, as some gases are flammable after a certain temperature and displaying the same information using an LCD. Lastly, the addition of a GPS module to send the location co-ordinates to the fire department in case the gas leaked is very high and vulnerable to fire accident.

IV PROPOSED MODEL

Fig.1 shows the overview of the proposed gas leakage detector. The system consists of a gas sensor and a temperature sensor, which will act as an input to the ADC. The ADC will convert the analog input from the sensors into digital output and provide input to the microcontroller. There is an LCD connected to the microcontroller, which will be displaying information regarding the gas leak. LED's are connected to the microcontroller to indicate the condition of the gas leakage. An Alarm system is connected to the microcontroller, which will be triggered which leakage crosses the threshold value. GSM and GPS module are connected to the microcontroller, which will send the alert SMS and the location coordinates which gas crosses the threshold value. first 4 sections constitute of the 1st half of the system i.e. the sensing part, the next half of the system is based on monitoring these parameters and that is done by the 5th section. This section consists of actuator like relay, buzzer (used for controlling action) which are turned ON once the parameter crosses the threshold.

A. Gas sensor (MQ-5)

MQ-5 is gas sensor, which is highly sensitive to LPG, natural gas and has a fast response time. It can sense the gas from 200-10000 ppm. They are used in gas leakage detecting equipment's in family and industry, are suitable for detecting of LPG, natural gas, town gas, avoid the noise of alcohol and cooking fumes and cigarette smoke.

B. Temperature sensor (LM35)

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The range of LM35 is rated for −55˚ to +150˚C range. It has low self-heating, 0.08˚C in still air.

C. GSM Module (SIM900A)

SIM900A is a dual-band GSM/GPRS engine that works on frequencies EGSM 900MHz and DCS 1800MHz. The SIM900A is integrated with the TCP/IP protocol; extended TCP/IP AT commands are developed for customers to use the TCP/IP protocol easily, which is very useful for those data transfer applications.

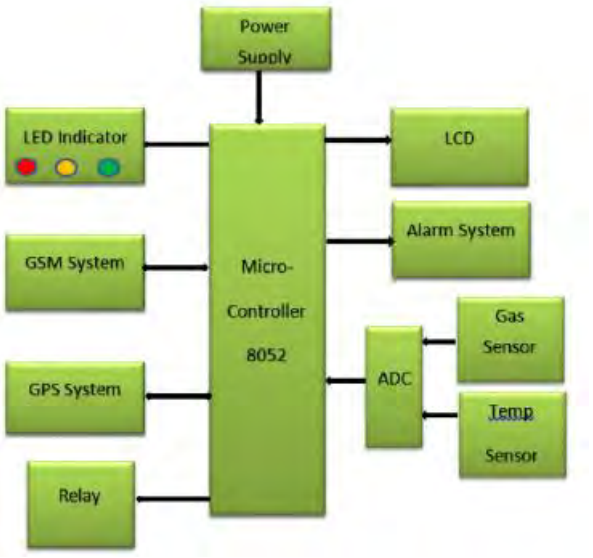


Fig. 1. Block Diagram of Gas Leakage Detection System

D. GPS Module (NEO-6M)

The NEO-6 module series is a family of stand-alone GPS receivers featuring the high-performance u-box 6 positioning engines. These flexible and cost-effective receivers offer numerous connectivity options in a miniature 16 x 12.2 x 2.4 mm package.

E. LCD (16x2)

LCD is used for displaying information. In 16x2 LCD each cursor is of 5x8 dots. It has 2 lines for displaying 16 characters on each line. The brightness of the LCD can be adjusted using a potentiometer.

V METHODOLOGY

Fig.2 shows the flow of the proposed methodology and following is the algorithm for the same.

1. Start
2. Check whether the gas is leaked, if yes go to next step else continue to check.
3. Is the gas leaked less than 25%, if yes go to next step else go to step 5
4. Glow green LED, display the parameters on LCD and go to step 2.
5. Is the gas leaked greater than 25% and less than 50%, if yes go to next step else go to step 7.
6. Glow yellow LED, show the parameters on the LCD and send SMS and go to step 3.
7. Glow red LED, display parameters on LCD, turn ON alarm system, send SMS and location and switch off the main power supply.
8. Stop.

The MQ-5 sensor will sense the gas in form of ppm and will convert it into voltage. The gas sensor has the range of the sensor resistance Rs is from 10-60K; therefore, the load resistance should be chosen such that the output voltage VO is maximized which leads to increasing the sensitivity of the entire detection system. The supply voltage VCC was 5 Volts, thus the range of the output voltage is 0.25-3.33 V, which covers most of the ADC range (0-5 V) [1].

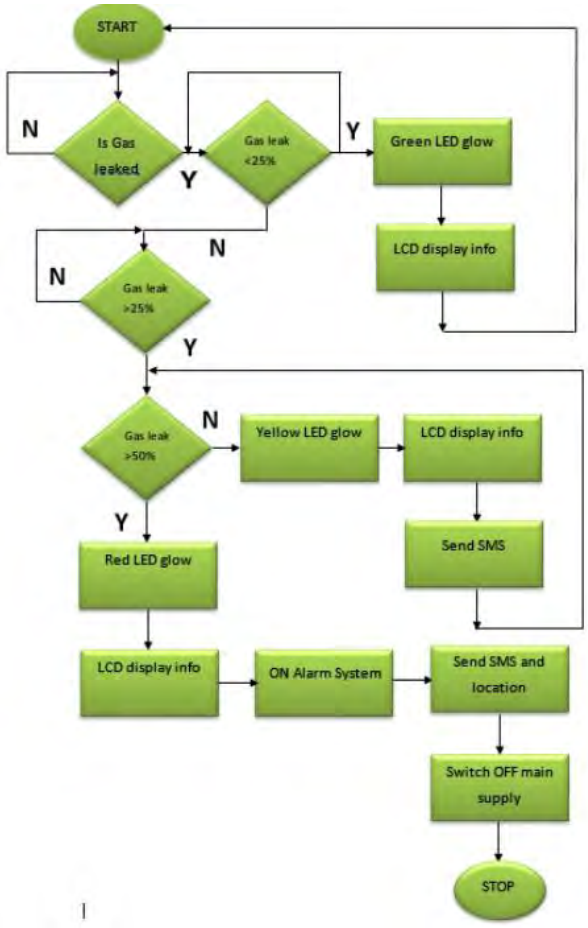


Fig. 2. Flow Diagram of Gas Leakage Detection System

The LM-35 sensor will sense the temperature and if the output is 100 mV, the temperature in centigrade will be 10 degrees centigrade. ADC will convert the analog input from the sensor to the binary digital input for the microcontroller. Microcontroller works with00 hexadecimal values so the binary input will get converted to hexadecimal then this value will get converted into a decimal value. If there is a normal gas concentration detected, the microcontroller displays a message onto the LCD indicating normal conditions [3][4]. The message also contains the percentage. In the normal condition where the level of gas concentration is less than 25%, the green LED will be turned on. When the level of gas concentration is between 25-50%, the yellow LED will glow. In case of an elevated gas concentration level i.e., Greater than 50%, the LCDs the dangerous gas level message also the red LED will be turned on and the alarm system will be activated. When the yellow led is turned on the microcontroller will command the GSM module to send the alert notification that the gas leaked is greater than 25% to the registered mobile number [4]. When the red led is turned on the microcontroller will command the GSM module to send the alert notification that the gas leaked is greater than 25% to the registered mobile number as well as to the fire department and also, the GPS location coordinate of the site will be send using GSM module is the gas leakage detected by MQ-5 sensor is above 50%. After all this process the Relay used in the system will disconnect the main power supply [4][5].

VI RESULT AND DISCUSSION

The Proposed system is simulated in proteus and following are the results. Fig.3 shows the parameters which are displayed when the gas leaked is less than 25%.

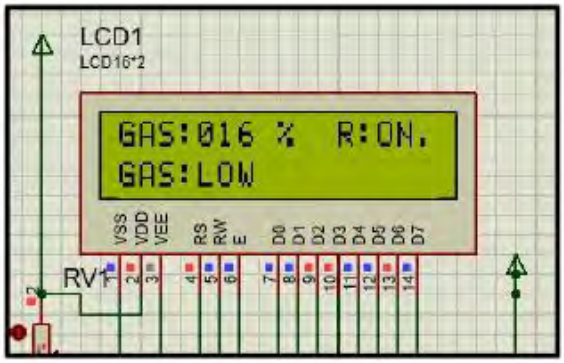


Fig.3 LCD output of gas leakage <25%

Fig.4 shows the parameters that are displayed when the gas leaked is between 25% and 50%.

Fig.4 LCD output of gas leakage <50%

Fig.5 shows the parameters that are displayed when the gas leaked is greater than 50% and Fig.6 shows the status of relay, which is off. In addition, Fig.7 shows that the SMS is send to the registered number through GSM.

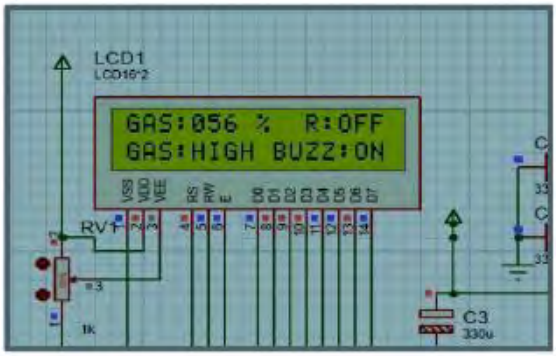


Fig.5 LCD output of gas leakage >50%

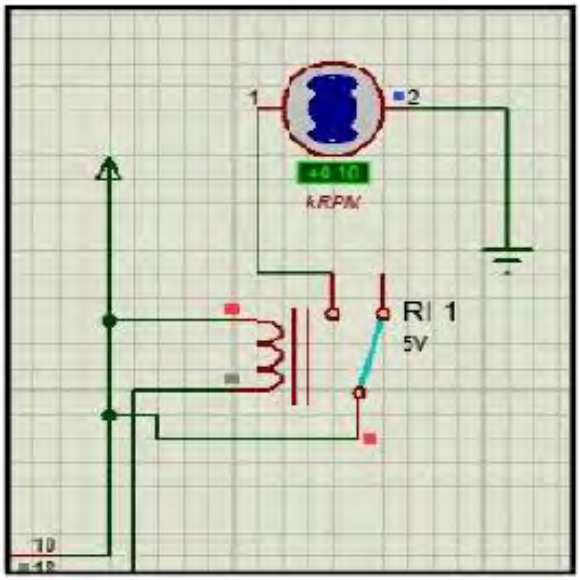


Fig.6 relay status

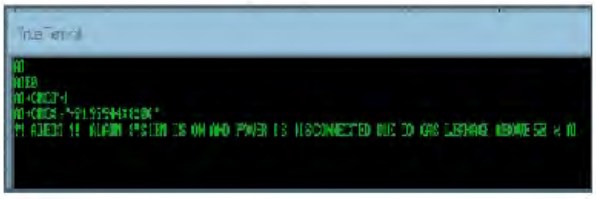


Fig.7 SMS through GSM

Fig.8 shows the latitude, longitude and altitude i.e, the coordinates of the location which is send to the registered number through GSM

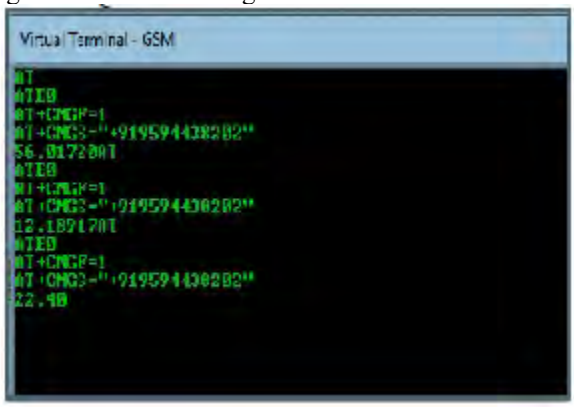


Fig.8 GPS coordinates through SMS

VII CONCLUSION

The proposed system will provide a safe, secure way for avoiding accidents. The proposed system, which can be installed at the industry, colleges, buildings, offices, school, will consist of gas sensor, GSM & GPS module, microcontroller unit, alarm system and relay. The future scope will include a load cell which will measure the weight of the gas cylinder and also the pressure sensor which will measure the pressure coming from the gas pipe and if the measure value is drastically changed from the average value, further preventive actions can be taken to reduce the risk of an accident. Also, more sensors can used simultaneously at different corners for a large-scale industry.

REFERENCES

[1] Luay Fraiwan, Khaldon Lweesy, Aya Bani-Salma and Nour Mani, "A Wireless Home Safety Gas Leakage Detection System," In Proc. IEEE Middle East Conference on Biomedical Engineering' 02,2011, pp. 11 - 14.

[2] Ravi Kishore Kodali, Greeshma, R.N.V., Kusuma Priya Nimmanapalli and Yatish Krishna Yogi Borra, "IOT Based Industrial Plant Safety Gas Leakage Detection System," In Proc. IEEE International Conference on Computing Communication and Automation' 12, 2018, pp. 1 - 5.

[3] Shruthi Unnikrishnan, Mohammed Razil, Joshua Benny, Shelvin Varghese and C.V. Hari, "LPG Monitoring and Leakage Detection System," In Proc. IEEE International Conference on Wireless Communications, Signal Processing and Networking' 03,2017, pp. 1990 – 1993.

[4] Suma V, Ramya R Shekar and Akshay Kumar A, "Gas Leakage Detection Based on IOT," In Proc. IEEE International Conference on Electronics Communication and Aerospace Technology' 06,2019, pp. 1312 - 1315.,2017, pp. 1990 – 1993.

[5] Asmita Varma, Prabhakar S and Kayalvizhi Jayavel, "Gas Leakage Detection and Smart Alerting and Prediction Using IoT," In Proc. IEEE International Conference on Computing and Comm

Smart Mirror: Time Saving Assistance

Gayatri kalyankar
E&TC department,
Thakur College of Engineering and Technology,
Mumbai, India,
gayatri.kalyankar9@gmail.com

Muskan Khandelia
E&TC department,
Thakur College of Engineering and Technology,
Mumbai, India,
muskankhandelia31@gmail.com

Satyaprakash Mishra
E&TC department,
Thakur College of Engineering and Technology,
Mumbai, India,
sp17.mishra@gmail.com

Deepak S Shete
E&TC department,
Thakur College of Engineering and Technology,
Mumbai, India,
deepak.shete@thakureducation.org

***Abstract* — "Smart Home Technology" represents one of the major sectors of Internet of Things that is becoming increasingly popular in our society today. The primary benefit of smart home technology is to simplify our day to day lives in any way possible. Some benefits include saving time, relieving stress, or even saving money. This can be achieved in different ways like automation of tasks, providing easy access to media and information, as well as providing personal comfort to the user. This area of technology is constantly updated by emergence of advanced smart devices. Smart mirror is one such idea that has been popular nowadays among commercial manufacturers and academia. A Smart Mirror is meant as a smart home technology that will integrate basic information a user needs. This paper describes how a Raspberry Pi device can be used as a central device along with other APIs and web services to enhance ordinary mirror. The mirror will display customized information to the user to access some basic information like time, weather statistics, newsfeed etc. at a glance. Also, this paper focuses on making the mirror cost effective and easy to use.**

Keywords—Smart mirror, IOT, news, weather, Smart home, raspberry pi.

I. INTRODUCTION

In the recent times, technology has become an important and inevitable part of our daily routines. With technology progressing at rapid pace, people are also expected to be more productive and efficient in their daily activities. Devices like smart phone, laptop, tablet have enhanced their ability to be productive and, more importantly, be time-efficient. However, as much as the use of such devices is time-efficient, it is also time-consuming as it has become yet another task on one's daily to-do list. In addition to this, demands and deadlines increased stress [7]. Therefore, good time management is the key to getting things done.

This device will basically help users save time in their busy morning routine which will, as a result, help people to be on time especially in the morning. For instance, in mornings finishing daily chores and getting ready to leave the house in time is a demanding process. At such times, checking the phone constantly to see what time it is or what the weather is like for that day, checking timing for a schedule meeting is time-consuming. Hence, the mirror will integrate all required information that the user would otherwise access in the morning via their phone or other technology at a glance [8].This will allow the user to plan for the day while completing their other chores. Some information that will be provided to users includes; the time and date, the weather for the day, a daily schedule, a to-do list, the users preferred news source, traffic delays to expect on the way to work, and much more.

There have been some interesting projects published on the Internet [2]. For instance, Philips Home Lab [3] created an intelligent personal care system that implemented an Interactive Mirror [4] to provide customized services to users. The system is capable of displaying TV feeds, monitor the latest weather, and so on. The mirror has an LCD display combined with a processor which provides the intended services and a mirrored surface mounted on the display. Another project developed by Sam Ewen and Alpay Kasal at Lit Studios [5] is a gesture and touch functional mirror. The main method of interacting with the mirror is by touching the screen. Five students at Chalmers University in Sweden designed the HUD Mirror [6].

They used a two-way mirror to allow the LEDs mounted behind to illuminate the information. The smart mirror described in this paper differs from the aforementioned projects mainly in that it offers unique features to improve the system and reduce its cost using raspberry pi.

II.PROPOSED METHODOLOGY

The smart mirror system is designed to be a user-friendly solution that offers simplified and personalized services in the form of a mirror. Hence, the system was structured to give the user a complete control over all services and functions through voice interaction. The schematic overview of the system can be divided into three distinct parts:

- Physical structure
- Smart mirror software
- Cloud services

A. Physical Structure

The physical structure of the system consists of a one-way acrylic mirror placed over a display monitor, a Raspberry Pi device, and a microphone. The setup allows the reflection of light rays from one surface of

the mirror while allowing light from the display to pass through. So, a user can see his refection in addition to the contents shown on the display.

The setup is finally enclosed with a frame to give the natural mirror feel to the system.

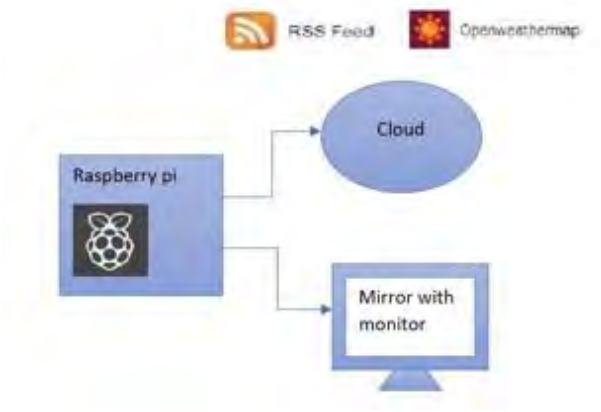


Fig. 1. Architecture of Smart Mirror

B. Smart Mirror Software

The smart mirror software: The smart mirror software was developed using css, html language. It consists of several modules which handle individual functions of the system, including weather information [10], current city, time and date information, news feeds and multimedia display.

C. Cloud Services

Amazon voice service is used to provide the system's voice assistant capabilities in addition to the added Alexa skills. Amazon web services is used to create a queuing system and lambda functions to process special vocal instructions from the voice assistant. This will make mirror a smart device.

Fig. 2. System voice command architecture

AVS is a platform that Amazon has provided to allow developers integrate "Alexa" into their projects. With an AVS enabled product, users can stream media, get updates on weather, traffic, and news, as well as ask general knowledge questions. Alexa (the brain behind the AVS system) is triggered when a user says the wake word, "Alexa". Once the device detects the wake word, it begins to listen for a request. The request is then relayed to cloud based voice service. It is thus a requirement to have a functioning Internet connection. The cloud-based voice service interprets the request and sends a command back to the device or in this case, the smart mirror system. Additional/custom skills - Skills are commands that Alexa can process. They are essentially applications but tailored specifically for AVS. Alexa provides a wide range of custom skills that are readily available to users of Alexa enabled devices. Perhaps the most impressive capability of AVS is that it allows the creation of custom skills that can be used to improve the richness of user experience. The number of existing custom skills runs into the tens of thousands [9].

This project created a new Alexa skill called "Smart mirror". This name represents what the uses say to indicate that they want to interact with the skill. The skill is created by visiting https://developer.amazon.com/alexa-skills-kit and selecting to create a new Alexa skill and listing the intents for the new skill. Intents are the various reasons/intentions a user could have for invoking the skill. Once the intents have been specified, the users need to create an interaction model. An interaction model represents how users interact with the new skill. The model contains various statements a user might say to interact with each of the intents in the new skill. Once the model has been built, the Alexa device (e.g., the smart mirror) connected to the amazon developer account would be able to access the skill [9]. A skill named "smart mirror" for instance may contain an intent called "get Time" and a sample utterance like "tell me the time". If a user says "Alexa, ask smart mirror to tell me the time", the Alexa Voice Service would recognize that the user is invoking the smart mirror skill. It would also recognize the user's intention for requesting the skill - "get Time". The new skill needs to be connected to a lambda function that will handle the skill requests. This can be done by specifying the endpoint of an Amazon Web Services (AWS) lambda function [1].

The following section highlights the steps to create such a function. Amazon provides AWS Lambda as a part of its Web Services. It is an event driven server less platforms which is used for computing and running code in response to events. It also has the capacity to manage the compute resources required by that code. Steps to create a simple lambda function. First, a free account to access the AWS console was created. Next, create a new function from scratch and specify a programming language of choice. A variety of programming languages are supported. In this paper, we are going to use Python. In the "Add triggers" panel, the "Alexa Skills Kit" should be selected to indicate that the lambda function will be triggered by an Alexa skill and that the Alexa Skill will pass a JSON request containing the details of the intent and request to the lambda function. The AWS lambda console contains an embedded IDE (Integrated Development Environment) which is used to define the lambda function. The lambda function will parse the JSON file from the Alexa Skill and pushes the intent and request details

into a simple queue data structure that the Smart mirror can access [9].

Fig. 3. Custom skill and lambda function structure

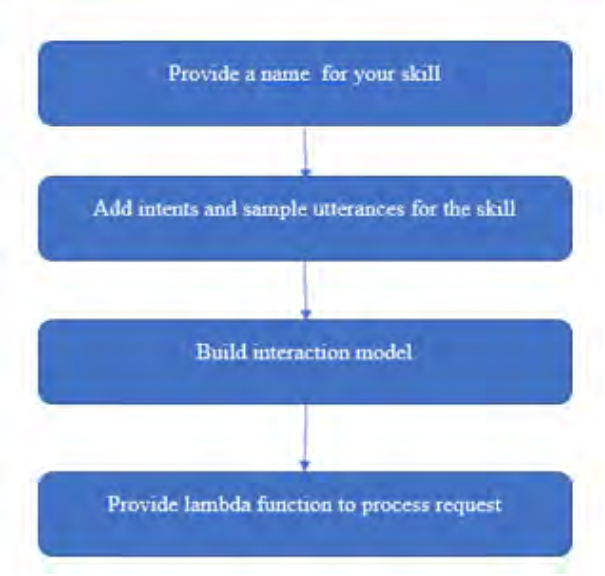


Fig. 4. Skill Creation Flowchart

III. RESULT AND DISCUSSION

Various test cases were performed individually and results were recorded. Setting up raspberry pi and making it compatible so that it can display various elements are mentioned in the table. First raspberry pi was setup then using java script, html and css; time and weather report was displayed. In this project, open weather map API was used to display weather.

Sr. No.	Test Case	Result
1	Raspberry Pi Setup.	Successfully installed a Raspberry Pi operating system image on an SD card.
2	Ensuring display of dynamic time for the system.	Dynamic Time for the system displayed.
3	Ensuring proper display date for the system.	Date for the system displayed.
4	Check compatibility of API.	Compatibility checked using openweathermap API.
5	Display of weather for specific location.	Successfully displayed weather for concerned city.
6	Display of Newsfeed.	Successfully displayed newsfeed using RSS.

Fig. 5. Output showing smart mirror display

IV. CONCLUSION AND FUTURE WORK

A Raspberry Pi device was used to enhance mirrors with intelligence to develop a cost-effective intelligent mirror system that not only works as a regular mirror, but also be able to display various kinds of information, such as news, weather, time and location. Drawbacks of similar projects were also studied and considering those, a new cost-effective and flexible design was planned. The proposed system will integrate several impressive features with a user-friendly architecture. A reliable and easy to use design will be used which will provide a service-oriented approach. Overall, the smart mirror proposed in this paper provides a central platform for smart home, further we can also include home automation applications. The smart mirror can also be implemented in various household and industrial applications. The mirrors can be further developed with advanced technologies and be deployed in salons, beauty parlours, cloth shops, hotels, etc.

REFERENCES

[1] Adokiye Charles Njaka,Na Li and Lin Li - Voice controlled smart mirror & multifactor Authentication A&M University.

[2] M. Patkar, “6 best raspberry pi smart mirror projects we’ve seen so far,” 2016. [Online]. Available: https://www.makeuseof.com/tag/ 6- best-raspberry-pi-smart-mirror-projects-weve-seen-far/.

[3] P. Research, “Meet philips research - research.” [Online]. Available: http://www.research.philips.com/technologies/misc/homelab /index.ht ml.

[4] T. Lashina, “Intelligent bathroom,” 2014. [Online]. Available: https: //www.researchgate.net/publication/228881021 Intelligent bathroom.

[5] A. Kasal and S. Ewen, "A project of the interactive mirror withartsy

visuals in lit studios," International Journal of Engineering Technology, Management and Applied Sciences, vol. 5, no. 5, pp. 1863–1869, May 2017.

[6] A. Bostrom and F. Ramstrom, "Head up display for enhanced user experience," Chalmers University of Technology in Sweden, 2014. [Online].Available:http://publications.lib.chalmers.se/records/fulltext/ 223949/223949.pdf.

[7] Mr. P. Mathivanan - Home automation using smart mirror - International conference on system computation and automation and networking 2019.

[8] Shridhar sk, Neelam vishal vivek,Bhagya jyothi, Aishwarya H M Smart mirror - an artificially intelligent personal assistant- International jounal for technological research in engineerig may 2019.

[9] "Alexa Voice Service - Integrate Alexa Directly into Your Connected Products." [Online]. Available: https://developer.amazon. com/alexa-voice-service.

[10] "IP geolocation web server." [Online]. Available: https://github.com/ fiorix/freegeoip "Weather API." [Online]. Available: https://openweathermap.org/.

Solar Powered Automated Irrigation System Using IOT

Shruti Patel
Department of Electronics and telecommunication Engineering, Thakur College of engineering and technology, Mumbai, India
pshruti759@gmail.com

Vishal Pandey
Department of Electronics and Telecommunication Engineering, Thakur College of Engineering and Technology, Mumbai, India
vishal23v@gmail.com

Anvita Birje
Department of Electronics and Telecommunication Engineering, Thakur College of Engineering and Technology Mumbai, India
anvita.birje@thakureducation.org

***Abstract* — IOT is a shared Network of objects where these objects interact through Internet. One of the important applications of IOT is Smart Agriculture. Smart Agriculture reduces wastage of water, fertilizers and increases the crop yield. Here a system is proposed to monitor crop-field using sensors for soil moisture, humidity and temperature. By monitoring these parameters the irrigation system can be automated if soil moisture is low. Agriculture plays vital role in the development of agricultural country. In India about 70% of population depends upon farming and one third of the nation's capital comes from farming. Issues concerning agriculture have been always hindering the development of the country. The only solution to this problem is smart agriculture by modernizing the current traditional methods of agriculture. Hence the project aims at making agriculture smart using automation and IoT technologies. It includes smart irrigation with smart control and intelligent decision making based on accurate real time field data. Thirdly, smart warehouse management which includes temperature maintenance, humidity maintenance and theft detection in the warehouse. Controlling of all these operations will be through any remote smart device or computer connected to Internet and the operations will be performed by interfacing sensors, Wi-Fi and actuators with Adriuno.**

Keywords* — *Automated, ESP 8266, Internet of things, Solar Power, Microcontroller, Sensors

I. Introduction

As the world is trending towards new technologies and implementations it is a necessary goal to trend up in agriculture too. Many researches are done in the field of agriculture and most of them signify the use of wireless sensor network that collect data from different sensors deployed at various nodes and send it through the wireless protocol. The collected data provide the information about the various environmental factors. Monitoring the environmental factors is not the complete solution to increase the yield of crops. There are number of other factors that decrease the productivity. Hence, automation must be implemented in agriculture to overcome these problems. In order to provide solution to such problems, it is necessary to develop an integrated system which wills improve productivity in every stage. But, complete automation in agriculture is not achieved due to various issues. Though it is implemented in the research level, it is not given to the farmers as a product to get benefitted from the resources. Hence, this paper deals about developing smart agriculture using IOT and given to the farmers. Agriculture is considered as the basis of life for the human species as it is the main source of food grains and other raw materials. It plays vital role in the growth of country's economy. It also provides large ample employment opportunities to the people. Growth in agricultural sector is necessary for the development of economic condition of the country. Unfortunately, many farmers still use the traditional methods of farming which results in low yielding of crops and fruits. But wherever automation had been implemented and human beings had been replaced by automatic machineries, the yield has been improved. Hence there is need to implement modern science and technology in the agriculture sector for increasing the yield. Most of the papers signifies the use of wireless sensor network which collects the data from different types of sensors and then send it to main server using wireless protocol. The collected data provides the information about different environmental factors which in turns helps to monitor the system. Monitoring environmental factors is not enough and complete solution to improve the yield of the crops. There are number of other factors that affect the productivity to great extent. These factors include attack of insects and pests which can be controlled by spraying the crop with proper insecticide and pesticides. Secondly, attack of wild animals and birds when the crop grows up. There is also possibility of thefts when crop is at the stage of harvesting. Even after harvesting, farmers also face problems in storage of harvested crop. So, in order to provide solutions to all such problems, it is necessary to develop integrated system which will take care of all factors affecting the productivity in every stages like; cultivation, harvesting and post harvesting storage.

Solar powered PV module is used which is an effective way to supply power to the setup.[1] Boost converter is used to charge the battery using solar energy. [2] Moisture sensors are used to detect the water level. [3] When moisture content of soil will low, pump will start automatically and farmers can get the information on his mobile through GSM module.[4]. Continuous feedback enables user to get information at any time necessary. Here another power source is used in order to supply power at time no solar energy is obtained MQTT protocol enables user to control the device from anywhere in the world. Connection issues may occur in rural areas and stable internet connection

may not be available at every place. Installing a substitute battery may get expensive.

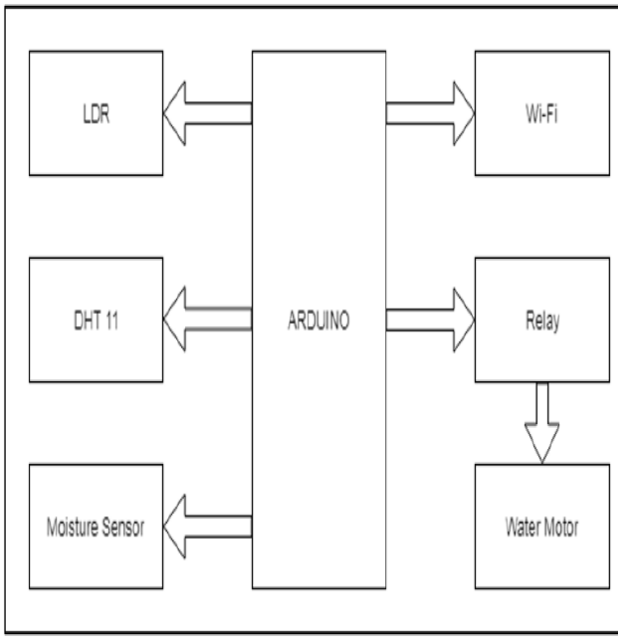
II. PROPOSED MODEL

The proposed model of solar powered automated irrigation system using IOT comprises of ESP-8266 as the wifi module, Arduino to control the system , Solar panel , DC pump , DTH11 humidity and temperature sensor for monitoring parameters in the area it is placed at.

The hardware layer consists of the sensor which collects the data and is sent to the Arduino which sends the data to the server. This process is done using ESP-8266. The decision making is done at the software level. The decision is sent to the Arduino which then controls the pump to switch on or switch off.

The software part comprises of a server on which data from the Arduino is collected. An existing database is set in order to check the range of the parameters gained by the sensors by which the decision making is done. The range can be altered depending on the requirement. The tracking of the data and alteration of the range can be done over an website which is provided

The project is based on the HTTP protocol. Which enables the user to communicate with the system from anywhere.



III. COMPONENT DESCRIPTION

A. ESP8266:

ESP8266 is a 3V Wi-Fi module very popular for its Internet of Things applications. ESP 8266 maximum working Voltage is 3.6V. ESP8266 module is low cost standalone wireless transceiver that can be used for end-point IoT developments. To communicate with the ESP8266 module, microcontroller needs to use set of the AT commands. Microcontroller communicates with ESP8266-01 module using UART having specified Baud rate.

ESP8266 Serial WIFI Module (ESP-07) is a cheap and easy way to connect any small microcontroller platform, like Arduino, wirelessly to Internet. ESP8266 has powerful on-board processing and storage capabilities that allow it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.

B. Arduino UNO:

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button.

Arduino is an open-source electronics platform based on easy-to-use hardware and software. **Arduino** boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

Some of its better features are: Its biggest advantage is that we connect the board to the computer via a USB cable which does a dual purpose of supplying power and acting as a Serial port to interface the Arduino and the computer.

C. Solar Charging circuit

The solar charging circuit comprises of a solar panel which gathers the light and through a boost circuit it powers the system. Using the renewable resource makes the system more efficient.

D. DC pump:

The DC pump is used to provide water in the field. The Arduino when gets the signal through the server controls the pump.

E. Boost Circuit:

The boost circuit uses the power gained by the the solar panel. When the switch is on it steps up the power and when the switch is off it does not do anything.

F. DTH11:

The DTH 11 sensor is a temperature and humidity sensor it gains the data from the area and sends it to the Arduino. The DHT11 is a basic, low-cost digital temperature and humidity sensor. It gives out digital value and hence we can give its output directly to data pin instead of ADC. It has a capacitive sensor for measuring humidity. The only real shortcoming of this sensor is that one can only get new data from it only after every 2 seconds.

IV. IMPLEMENTATION

The rate of irrigation, physical factors etc are continuously uploaded in the server. The manual mode gives option to select the rate of releasing water by pumps, duration of irrigation etc. In the first phase the autonomous mode decides the rate of irrigation according to the present physical parameters by the analysis of previous standard surveys uploaded initially in server. The next phase of automation will recognize the ideal rate of irrigation by using machine learning where the physical factors, rate of irrigation and the rate of growth in the first phase are used as training data. The pumps can also be controlled from a distant place via web-based apps or mobile apps.

The product will be like a thin slab having all the sensors embedded on it. The product possesses a vertical track along which an ultrasonic sensor traverses to and from to measure the longitudinal plant growth. Another sonar moves in a horizontal track in to map the distance between the crops (in a particular plot or area) and the product itself to monitor the secondary growth. When the implementation of fertilizers and pesticides is executed the system administrator will have the option to switch on to a special mode where the whole system becomes dedicated in supervising the change in moisture content, acidity of the soil and the rate of photosynthesis and transpiration in a more precise way for studying how the plants react immediately to the fertilizers. It also observes how the Air Quality Index (AQI) is changing for the application of fertilizers. The system here consists of three components. First component is the Arduino Microcontroller part where Soil Moisture and Temperature Sensor deployed in soil are connected to Microcontroller which gives the moisture and temperature output based on soil condition and Temperature.

The data received by Arduino are then sent using Serial communication which is second component. The predicted output is then used for sending the control signal via the serial communication to Arduino for controlling water pump for watering the field accordingly. The last and final component is recording the soil moisture and Temperature level and prediction with date and time in the server for farmers to access from device to have good knowledge and understanding on field being irrigated. In control section, the system is turned on using the application, this is done using the on\off buttons in the application. Also, this system is turned on automatically when the moisture of the soil is low, the pump is turned on and depending on the moisture content. The application has a future feature of taking the time from the user and irrigate the field when the time comes. In manual mode, there is a manual switch in the field to make sure that if the system fails, one can turn off the water supply manually. Other parameters like the moisture sensor shows the threshold value and the water level in the soil.

V. REQUIREMENT ANALYSIS

Hardware Requirements:

- 4 GB RAM.
- 100 GB HDD.
- Intel 1.8 GHz Processor Pentium 4
- Arduino UNO
- ESP8266
- LDR
- Moisture Sensor
- Temperature Sensor

Software Requirements:

- Windows XP, Windows 7,8
- Visual Studio 2013
- MS SQL Server 2012/14
- Arduino IDE

VI. RESULTS

The solar charging part has been implemented using a solar panel and a boost circuit. This battery which is charged using solar panel will then provide power to the system, the sensors(DTH11) will be connected to the arduino. The sensor will measure two parameters humidity and temperature and this data will be sent to the server using wifi module ESP8266 ,it will then send the data to the arduino which will do the decision making of turning the pump on or off.

VII. CONCLUSIONS

For future developments, it can be enhanced by developing this system for large acres of land. Also, the system can be integrated to check the quality of the soil and the growth of crop in each soil. The sensors and microcontroller are successfully interfaced and wireless communication is achieved between various nodes. Also, the system can be further improved by adding machine learning algorithms, which are able to learn

and understand the requirements of the crop, this would help the field be an automatic system. The observations and results tell us that this solution can be implemented for reduction of water loss and reduce the man power required for a field.

REFERENCES

[1] Jia Uddin, S.M. Taslim Reza, Qader Newaz, Jamal Uddin, Touhidul Islam, and Jong-Myon Kim "*Automated Irrigation System Using Solar Power*,"2012 7th International Conference on Electrical and Computer Engineering, Dhaka, Bangladesh. December 2012.

[2] VR Balaji and M.Sudha "*Solar powered auto irrigation system*" International Journal of Emerging Technology in Computer Science & Electronics ISSN: 0976-1353 Volume 20 Issue February 2016.

[3] Kavita Bhole and Dimple Chaudhari "*Solar powered sensor-based irrigation system*" International Research Journal of Engineering and Technology Volume: 03 Issue: 02 | Feb-2016.

[4] Kshirod Kumar Rout, Samuchita Mallick, Sivkumar Mishra "*Solar Powered Smart Irrigation System Using Internet of Things*"2nd International Conference on Data Science and Business Analytics, At ChangSha, Hunan 2018.

IOT Based Coal Mine Safety System using MQTT

Anand Bhagat
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
banand140@gmail.com

Shumaq Latif
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
shumaqlatif@gmail.com

Sahil Kesarkar
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
sahil.kesarkar@gmail.com

***Abstract*— Coal is one of the most important fuel sources and is of paramount importance to many industries, often regarded by many as Black Diamond. But workers in coal mines face many environment related problems such as high temperature, humidity, release of harmful gases to name a few. These factors create a rather dangerous environment for workers to work in and thus poses a serious risk to their very lives. As a means of reducing the intensity of the problem, we have proposed a model which will sense these environmental parameters from different locations in the mines and sends alerts to the mines control room so that appropriate actions can be taken whenever there seems to be a dangerous situation. Various low-power and cost-effective sensor platforms have been developed based upon recent advances in wireless communication and microsystem technologies. The increasing study of WSNs aims to enable computers to better serve people by automatically monitoring and interacting with physical environments. Here NodeMCU will be used as an MQTT publisher for these parameters sensed by the different sensors. The values of these parameters from different mine locations are sent via MQTT, by being subscribed by a Raspberry Pi which acts as an MQTT broker here. When these values will exceed certain threshold values, an alert by email can be sent to the mine control office so that required actions can be taken. This also generates an alarm for the workers to evacuate the place. This published data can also be stored in files for data collection and big data analytics so that more efficient systems can be developed to improve the efficiency and reduce the risk of workers potentially losing their lives.**

Keywords—IOT, MQTT, Safety Sensors, Thinger IO, Wireless sensory network

I. INTRODUCTION

Coal is a very important natural resource to our country. The most significant uses of coal are in generation of electricity, steel production, cement manufacturing and as a liquid fuel and many industrial applications. It is said that coal can help in a significant amount of economic growth of any country. Future of India in the energy department, and its prosperity are integrally dependent upon mining and using coal, its most abundant, affordable and dependent energy supply. But there are many hazardous conditions like increase in temperature and humidity, release of harmful gases. These conditions create a dangerous environment for workers to work in and pose a risk to their lives. Due to this, workers are either leaving their jobs in coal mines or not at all willing to opt for such jobs as mining. This is creating lots of problems in availability of workers for the coal mining industry. Thus, safety of the worker in a coal mine has become a serious issue to be addressed. It is quite difficult to monitor all environment conditions continuously in a coal mine by human beings. But this task can be easily done by very economically viable sensors placed at different locations in coal mines. These sensors will be live monitoring the different parameters which can cause incidents. The data from this monitoring will be synchronized among the sensors and alarms, thus alerting when danger occurs. The same data can be uploaded and stored on cloud; thus, we create an Internet of Things system for safety and alerting.

IoT is a trend-setting innovation in which all the data from sensors is stored in the cloud where it can be easily accessed from the cloud. Sensors and actuators for gathering the data and sending across the internet are also included in this advancement. We use cloud not only to store data but also for data analysis, gathering, visualization. Such an emerging technology can be used in various IoT applications like agriculture, health, smart home etc. to make the already existing systems more efficient. The key characteristics of the cloud include on-demand service provision, ubiquitous access, resource pooling and, elasticity. So we have proposed a coal mine safety framework. In our work, we will be tackling the issues by checking every one of the information gathered by the sensors which we have utilized and the observing is finished utilizing the Thinger platform. controlling is possible by both automatically and manually. The microcontroller here in the work we have utilized is Node MCU.

The rest of the paper is organized as follows: In section II, we present the literature survey. In section III, we discuss the proposed model. We discuss the results and outcomes in section IV. In section V, we provide the conclusion of our work.

II. LITERATURE SURVEY

ZigBee is a wireless communication Technology to collect the various parameters of the terminal transmitted to the sensor on the tunnel gateway.

Rajkumar Boddu, P. Balanagu and N. Suresh Babu have presented a solution suitable to mine wireless communication, safety monitoring, give a proof to the further study [1]. The integrated mine safety monitor system using ZigBee and CAN technology, combines the personnel positioning system with the gas detection system to achieve the staff attendance, distance measurement positioning, gas detection and other functions. T. Asesh Kumar and K. Sambasiva Rao have shown that in this Paper they have used CAN Bus along with Zigbee technology to reduce the cost and increase improve the speed of communication between base station and sync nodes [2]. The Zigbee technology is widely used technique for underground communication. The use of RFID technology is far better for positioning or localization of underground mine workers and the locomotive devices
inside mines. C. Shobana Nageswari, C.G. Sangeetha and V.B. Yogambigai have developed a better communication technology which has to be employed for an intelligent sensing and warning system. For this, RF technology is chosen for the communication inside the mines [3]. The NodeMCU is a very cost effective and low power, Wi-Fi-based microcontroller. This data is subscribed by the Raspberry Pi which acts as an MQTT broker. Raspberry pi is a low-cost, low-power standalone computer. Ravi K Kodali and Shubhi Sahu have proposed A model which senses these environmental parameters from different locations in the mines and sends alerts to the mines control room so that appropriate actions can be taken whenever there seems to be a dangerous situation [4]. Coal mine safety systems are fixed with gas sensor modules, the LDR sensor, temperature/humidity sensor, buzzer and led. Everything is integrated to the Arduino Uno using IoT. D. Prabhu, V. Naga Nikhil and J. Shiva Kumar have given an overview of IoT based coal mining safety for workers using IoT and Arduino. Apart from this, it consists of LDR, Gas sensor, Temperature and Humidity sensor which are used to monitor the underground hazards [5]. A coal mine safety system is implemented using Arduino and comparative estimations is given to webserver by beginning ESP8266 module subject to Wi-Fi correspondence. At the same time using NRF24L01 handset module to transmit data from the mine fragment which can be used to screen and brief move to be made. S. Kumari, T.K. Divya, K. Keerthana, S. Nisha and S. Pallavi have presented a system making using explicit sensors sort out subject to MEMS used to screen the ecological variables parameters of underground mine place and drives each and every perceived parameter/ascribes to/characteristics to ARDUINO based ATmega2560 Microcontroller Unit (MCU) [6].
The systems utilizing Zigbee and RFID were not cost effective and produced a certain communication delay which made them less efficient. These systems did not store collected data into a database. If the data can be dumped into data buckets records can be maintained. Moreover, personnel tracking can be implemented for improved safety and attention towards each miner.

III. PROPOSED SYSTEM

In this proposed system, we aim to reduce the overall cost while maintaining good efficiency and fast communication between sensors. This is achieved by implementing NodeMCU (ESP8266) as the building block for the sensor. For parameter monitoring gas sensors and temperature sensors will be interfaced with this Wi-Fi module. A network of sensors will be publishing data to a central unit using MQTT protocol. Besides detecting critical conditions and alerting the workers, this system will be storing the monitored values in a database. For the database we will be using an IOT platform ThingerIO. This platform allows us to easily manage all our connected devices, monitor the data on a dashboard with widgets such as time series chart.

COAL MINE SAFETY SYTEM

In this proposed system the coal mine safety systems are fixed with gas sensor modules, temperature/humidity sensor and buzzer. We integrate all the sensors to the Node MCU. First an account need to be created on Thinger platform.
In this system we mainly have monitoring and controlling systems monitoring system we monitor all the data from different sensors. gas sensor detects the gas in the coal mine environment, if the gas level exceeds the normal level then the buzzer gets high so that the mine workers gets notified. These sensor values are continuously uploaded to the cloud (Thinger.io) for analysis and also for further use.
The temperature and humidity values are also he monitored inside the coalmine.

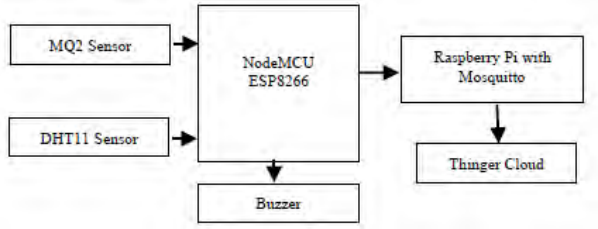


Fig.1. Represents an overview of the proposed system

GAS SENSOR

MQ2 gas sensor will be used which is an electronic sensor used for sensing the concentration of gases in the air such as LPG, propane, methane, hydrogen, alcohol, smoke and carbon monoxide. It contains a sensing material whose resistance changes when it comes in contact with the gas. This change in the value of resistance is used for the detection of gas. This sensor works on 5V DC voltage. It can detect gases in the concentration of range 200 to 10000ppm. This sensor contains a sensing element, mainly aluminum-oxide based ceramic, coated with Tin dioxide, enclosed in a stainless-steel mesh. Oxygen gets adsorbed on the surface of sensing material when it is heated in air at high temperature. Then donor electrons present in tin oxide are attracted towards this oxygen, thus preventing the current flow. When reducing gases are present, these oxygen atoms react with the reducing gases

thereby decreasing the surface density of the adsorbed oxygen. Now current can flow through the sensor, which generated analog voltage values. These voltage values are measured to know the concentration of gas. Voltage values are higher when the concentration of gas is high.

Fig.2. MQ2 Gas sensor [7]

DHT11 SENSOR

DHT11 sensor consists of a capacitive humidity sensing element and a thermistor for sensing temperature. The humidity sensing capacitor has two electrodes with a moisture holding substrate as a dielectric between them. Change in the capacitance value occurs with the change in humidity levels. For measuring temperature this sensor uses a Negative Temperature coefficient (NTC) thermistor, which causes a decrease in its resistance value with increase in temperature. Humidity sensing component has two electrodes with moisture holding substrate (usually a salt or conductive plastic polymer) sandwiched between them. The ions are released by the substrate as water vapor is absorbed by it, which in turn increases the conductivity between the electrodes. The change in resistance between the two electrodes is proportional to the relative humidity. Higher relative humidity decreases the resistance between the electrodes, while lower relative humidity increases the resistance between the electrodes.

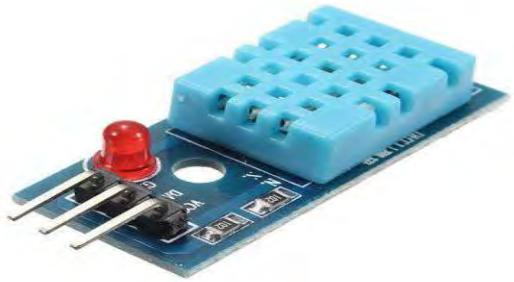


Fig.3. DHT11 sensor [8]

NodeMCU

The Node Micro Controller Unit (NodeMCU) is used as a gateway. It has inbuilt Wi-Fi module which is used to send the sensor data to cloud for storage and analysis. The main reason behind selecting NodeMCU is that the sensors used in our project uses only digital pins and one analog pins are required. Also, it consumes less power (3.3v) and is of low cost when compared to other microcontrollers /processors like Arduino. Node MCU is connected to gas sensor and temperature sensor. All the values are connected and send to Cloud server (Thinger).

Fig.4. Node MCU [9]

The ESP8266 is designed and manufactured by Espress if Systems. NodeMCU contains all crucial elements of the modern computer: CPU, RAM, networking (Wi-Fi), and even a modern operating system and SDK. The features like establishing a Wi-Fi connection with just a few lines of code, Plug and play mode, Programmable Wi-Fi module and Arduino like software and hardware I/O made NodeMCU an IoT Tool that is best suitable for various applications based on IoT. It has a deep sleep mode which consumes 60mA is useful for the low power consumption of an application.

BUZZER

The piezo-electronic buzzer here is an audio device of sorts, providing a sound of a particular tone when electricity is passed through it. There are a variety of buzzers depending on factors such as frequency, decibel level and type of buzzer.

Fig.5. Buzzer

MQTT

Message Queuing Telemetry Transport (MQTT) is a light weight transport protocol that efficiently uses the network bandwidth with a 2 byte fixed header. MQTT works on TCP and assures the delivery of messages from node to the server. Being a message oriented information exchange protocol, MQTT is better suited at IoT applications than any RESTful services because MQTT has a very lightweight requirement on memory, consequently leading to lower transmit power. This is a huge advantage as compared to REST as they have large header sizes and demand more power, which is a problem where nodes in an IoT infrastructure need to conserve their energy to as much an extent as possible. MQTT is a publish/subscribe based protocol involving clients and brokers. Clients can be publishers or subscribers. When a publisher publishes data, the broker receives the information. The broker is in charge of receiving subscription requests from subscribers and sending the published information from the publishers to the subscribers.

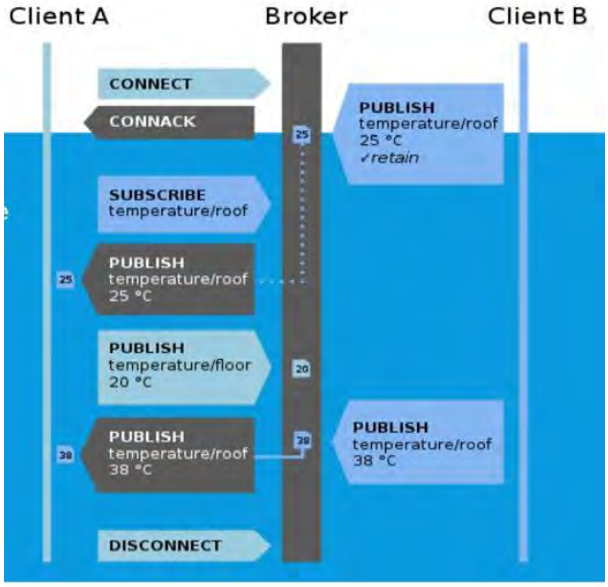


Fig.6. Image of MQTT Protocol [10]

MOSQUITTO

Mosquitto is an open source MQTT broker. It provides a lightweight server implementation of the MQTT protocol. It uses MQTT protocol to send and receive the messages. In order for the Raspberry Pi work as an MQTT broker, Mosquitto is needed to be installed on the Raspberry Pi. Its
installation is very easy and simple. It requires less memory allocation on the Raspberry Pi.

RASPBERRY PI

Raspberry Pi is a low cost, low power standalone single board computer. It can be easily powered up by micro USB cable using power bank or laptop. It has an Ethernet port and on-board Wi-Fi 802.11. It runs on the Raspbian operating system, which is a version of Debian customized for the hardware of the Raspberry Pi.

Fig.7. Raspberry Pi 4 [11]

THINGER.IO Platform

It is an open source platform for IoT. It provides scalable cloud infrastructure for connecting things, devices. With the
Thinger io, devices can be controlled from internet within minutes. To use the thinger platform first create n account in the thinger platform. In the console a dashboard, it will show the number of devices connected. It can connect up to 4 devices at a time in the platform. In Devices, you can manage and access the item .it displays how many devices are connected in the project.

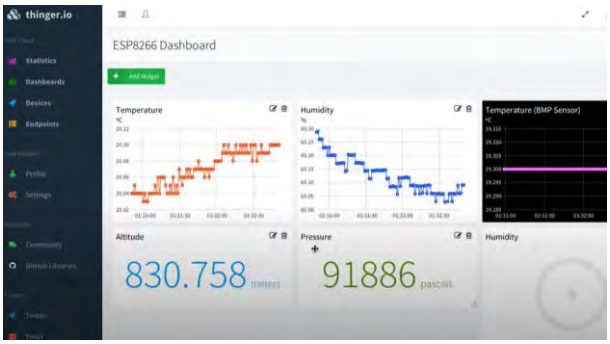


Fig.8. Image of Thinger io platform

A dashboard is created using an dashboard id ,Each dashboard can be connected to different sensors and actuators .Widgets is created in the dashboard for monitoring the values .In Data buckets, here we can access and manage your buckets .Data buckets are used to store the historic information about the project .End points are used to communicate with third party devices, here in endpoints can be called by devices to make the HTTP request ,sending emails etc.

FLOWCHART OF PROPOSED SYSTEM

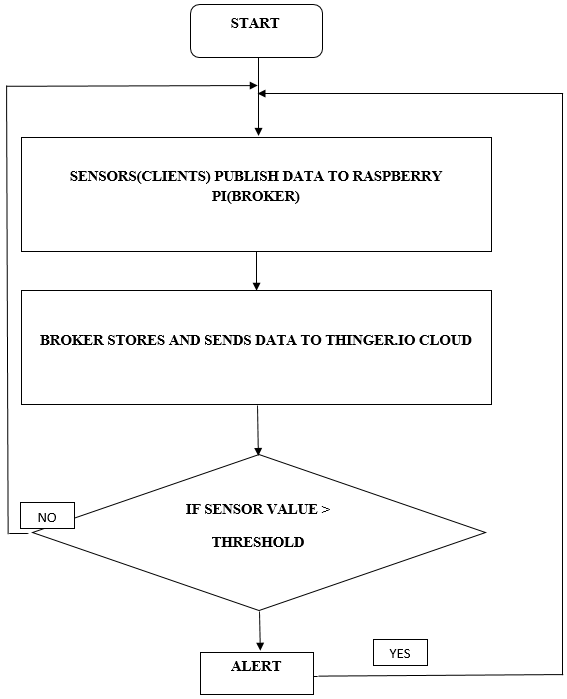


Fig.9. Proposed flowchart

IV. SIMULATION AND EXPECTED RESULTS

SIMULATION

For demonstrating a single sensory unit and its response to change in environment (here, gas) we have used Tinkercad simulation. The simulated sensory unit consists of a MQ2 sensor connected with Arduino UNO board with a buzzer for indicating values going beyond the threshold.

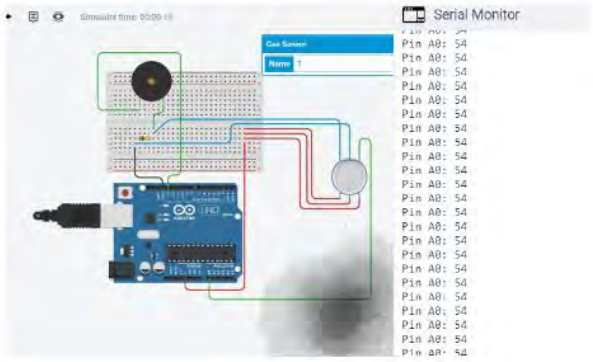


Fig.10. Reading when smoke is not detected

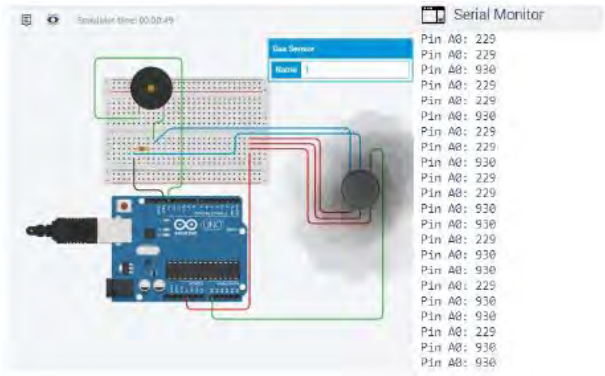


Fig.11. Reading when smoke is detected

EXPECTED RESULTS

These monitored values will be represented using widgets like time series graphs, text/value, LED indicator etc. on the ThingerIO platform.

Fig.12. Screenshots values of all the sensors that will be displayed on the Thinger Cloud using widgets

The widgets can be modified as required, according to what needs to be observed. Here in the sample screenshot shown below, two widgets are selected which are a time series graph. It shows the live monitored values of temperature and humidity. An LED widget can be added (as shown above) to indicate whether the parameter values have exceeded.

Fig.13. Expected graphics on widgets

V. CONCLUSION

We have come up with the Implementation of Coal mine safety system is implemented using MQ2 Gas sensor, DHT11 sensor & Buzzer to increase the safety of the workers in the coal mine and to prevent them from danger.

We have also come up with the implementation of a network where the different NodeMCUs keep publishing sensor data to the Raspberry Pi. By using this system constant checking of the coalmine and alerting the worker is done by using Thinger IO

REFERENCES

[1] R. BODDU, P. BALANAGU, and N. S. BABU, “Zigbee Based Mine Safety Monitoring System With Gsm,” Int. J. Comput. Commun. Technol., no. 5, pp. 98–102, 2015, doi: 10.47893/ijcct.2015.1283.

[2] T. A. Kumar, “Integrated Mine Safety Monitoring and Alerting System Using Zigbee & Can Bus,” IOSR J. Electr. Electron. Eng., vol. 8, no. 3, pp. 82–87, 2013, doi: 10.9790/1676-0838287.

[3] R. K. Kodali and S. Sahu, “IoT based safety system for coal mines,” Proc. 2018 Int. Conf. Commun. Comput. Internet

[4] Things, IC3IoT 2018, pp. 147–150, 2019, doi: 10.1109/IC3IoT.2018.8668184.

[5] C.Shobana Nageswari, C.G. Sangeetha, V.B. Yogambigai “IoT based Smart Mine Monitoring System, International Journal of Electronics”, Electrical and Computational System (IJEECS) ISSN 2348-117X Volume 7, Issue 4 April 2018.

[6] D. Prabhu, V. N. Nikhil, and J. S. Kumar, “IoT Based Coal Mining Safety for Workers using Arduino,” vol. 9, no. 10, pp. 23931–23934, 2019.

[7] S. Kumari, T.K. Divya, K. Keerthana, S.Nisha, S.Pallavi, " IOT based Coal Mine Safety Monitoring and Controlling", International Journal of Advanced Engineering Research and Science (IJAERS), Vol-7, Issue-3, Mar- 2020.

[8] "MQ2 Gas Sensor", MQ2 Flammable Gas Smoke Sensor [Online]. Available: https://www.electronicscomp.com/mq2-flammable-gas-smoke-sensor-module-india .

[9] "DHT11 Sensor", DHT11 Temperature and Humidity Sensor [Online]. Available: https://www.electronicscomp.com/dht11-temprature-humidity-sensor-module-india .

[10] "Node MCU", NodeMCU ESP8266 CP2102 WiFi Board [Online]. Available: https://www.module143.com/nodemcu-esp8266-cp2102-wifi-board .

[11] "MQTT Protocol", MQTT (Wikipedia) [Online]. Available: https://images.app.goo.gl/tvZ7qEtoKPX9xr817 .

[12] T. "Raspberry Pi 4", Raspberry Pi 4 Model B with 2GB Ram [Online]. Available: https://www.electronicscomp.com/raspberry-pi-4-model-b-with-2-gb-ram-india .

Women's Safety Gadget using IoT

Kajal Sharma
Department of Electronics
Thakur College of Engineering and Technology
Mumbai, India
Kajals7496@gmail.com

Neha Samudra
Department of Electronics
Thakur College of Engineering and Technology
Mumbai, India
nehasamudra18@gmail.com

Aditi Vichare
Department of Electronics
Thakur College of Engineering and Technology
Mumbai, India
aditisv28@gmail.com

***Abstract*— In today's day to day life, we hear many unfortunate incidents taking place in Women's case. Most of the items available for woman's safety are classic "panic button" devices (or apps) that are concealed within a smart watch or piece of jewellery which will contact either the authorities or pre-selected emergency contacts when activated. Other options include an array of alarms that can be turned on instantly with the dual aims of scaring any would-be attacker off and attracting the attention of passersby to help. Such devices are expensive with prices ranging up to Rs 10,000. The device being implemented is affordable and portable device for women's safety that comprises of Node MCU ESP12 and a neo6M GPS module with GPS tracking and emergency alerts.**

Keywords—Node MCU, GPS module, IoT, Panic button.

I. INTRODUCTION

Today women are contributing equally in every sector of the society. But even in today's modern era the safety of women is overlooked. Every day we may hear several unfortunate incidents occurring in the case of women, it may be sexual harassment, rapes or violence against women. Violence against women is one of the most common crimes in the country. According to the National Crime Records Bureau (NCRB) 2018 annual report, 33,356 rape cases were reported across India in 2018. Apart from this many such events remain unreported. The National Crime Records Bureau report of 2006 states that around 71% of sexual harassments are unreported. This suggests that safety of women is crucial. The only way to stop these crimes is by focusing on the prevention. Thereby arising a need of a device that generates emergency alerts for the timely protection of women. IoT is the emerging technology of today with over 31 billion devices installed currently. The potential economic impact of IoT will be from $3.9 trillion to $11.1 trillion per year by 2025. India alone had over 480 million internet users in the year 2018. The projection till 2023 is over 660 million users. This device contacts to women's helpline numbers nearby and the registered mobile numbers when women find themselves in danger. The IoT device functions on human intervention and can send alerts.

II. LITERATURE SURVEY

Raspberry pi, GSM/GPS module, buzzer, nerve stimulator, IOT [1]. This device is used for defense system, especially designed for women in hardship ARM controller is used for tracking mechanism. Tracking mechanism which is called GPS is connected to ARM controller. The capacitive sensor needs to be pressed for fraction milliseconds to alert locate, and can send emergency message to the emergency contacts with intent location and the buzzer will alert to nearby people for help, then [2].

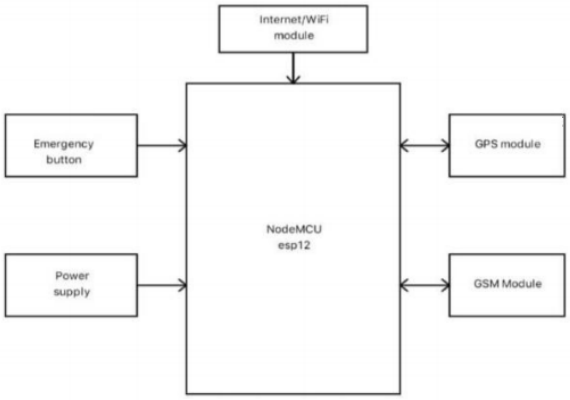


Fig.1 Block Diagram

When the women is in threat, the device senses the body parameters like heartbeat rate, change in temperature, the movement of victim by flex sensor, MEMS accelerometer and the voice of the victim is sensed by sound sensor. When the sensor crosses the threshold limit the device gets activated and traces the location of the victim using the GPS module. By using the GSM module, the victim's location is sent to the registered contact number. Not a cost-effective circuit. Cannot be carried anywhere as heavy components are used in it. Cost is optimized Used in form of belt so that it can be carried anywhere.[3] smart clothes look for a balance among fashion, engineering, interaction and science to reinvent technologies. They can communicate with smartphones to process biometric information such as heart rate, temperature, breathing, stress, movement, acceleration, or even hormone levels along with Location and environmental sensors. Smart Wearables can be Near-body wearables such as belts or clips, On-body wearables like watch or sunglasses, In-body wearables and Electronics textiles.[4] Comprises of wireless sensor networks, cloud computing, temperature sensor, audio sensor, RF detectors, laser, RFID, NVG, thermal imaging. Using IOT technology it is implementing safety for defense and public. It basically uses IOT and Cots technology based on the operational requirements and protocols that address the most significant capabilities. This approach gives defense and PS greater leverage in their IOT investment, allowing them better to spend on R&D which exploiting the military IOT potential.[5] This is alerting device in

which GSM is used which can send SMS to mobile which is connected to raspberry pi and a switch is connected which activate buzzer and nerve stimulator. When user will say emergency through android application call or SMS will be received at the mobile no. [6] It made in the form of glove. The person using this has to use it on the attacker to activate it. The circuitry is mounted in the within the glove. The inner part is well insulted to avoid any danger for the user. When this glove is used it gives shock to the attacker. [7] When in danger the Bluetooth button in the ring is to be pressed, if signal from mobile device is received then custom message or voice call can be sent to saved contacts or nearby police station along with current location via application created [8]. The system indicated by human interface. Fall detector to activate the system and the armband have the GPS/GSM kit interface.it is used as medical alert system.[9] When the switch in the sensor is pressed it generated a msg in located link which shows current location on google maps [10].

III. DESIGNING OF BLOCK DIAGRAM & FLOWCHART

Interfacing a GPS module neo6 with NodeMCU esp 12e. A simple local web server is created using NodeMCU and the location details are updated in that server webpage. Specialty of this IoT based project is we can check the location in Google Maps by clicking on the link provided in the web page. You can also open this webpage and check the location from anywhere by activate port forwarding in your modem/router. GPS module takes some time to capture location details once it is powered on. NodeMCU starts webserver and waits for a client to get connected to the webserver. Once client is connected to the webserver, NodeMCU sends location details to connected client. The location details are displayed in a simple webpage designed using HTML. The link to the webpage is provided in the alert message sent in case of emergency situations along with Google maps link. The block diagram specifies the modules that attached with the NodeMCU that includes Wi-Fi, GSM, GPS module, push button and power supply. Global positioning system (GPS) module is very adaptable and can be found in practically any industry division. The utilizations of GPS are:

1. Location - deciding a position
2. Navigation - getting to start with one area then onto the next
3. Tracking - checking an item or individual movement
4. Mapping - making maps of the world
5. Timing - bringing accurate timings to the world.

GSM/GPRS module is utilized to set up communication between a computer and a GSM-GPRS framework. Global System for Mobile communication (GSM) is a design utilized for mobile communication in a large portion of the nations. Global Packet Radio Service (GPRS) is an augmentation of GSM that empowers higher information transmission rate.

GSM/GPRS module comprises of a GSM/GPRS modem amassed together with power supply circuit and communication interfaces (like RS-232, USB, and so on) for the computer. The model used for designing this prototype comes with an attached mic and speaker ESP8266EX offers a complete and self-contained Wi-Fi networking solution; it can be used to host the application or to offload Wi-Fi networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash. In has integrated cache to improve the performance of the system in such applications.

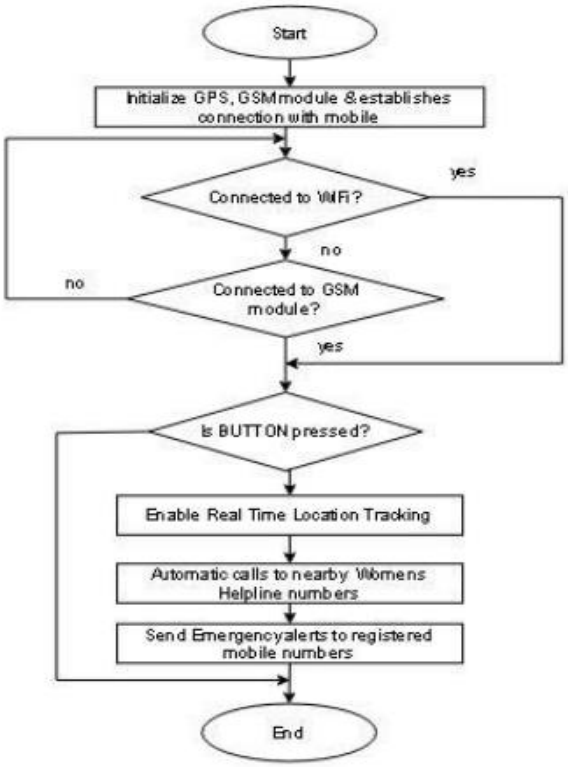


Fig. 2 Flowchart

Whenever push button is pressed it initializes Wi-Fi, GPS, GSM module. After this it checks for mobile Wi-Fi after successful connection with Wi-Fi it checks if panic button is pressed then call or voice notes sent to nearby woman's helpline and Message register mobile no. will be send along with message. A web page link is sent which displays the location and time of the gadget when the alert was generated if in any case due to network issue of the mobile it is not available to communicate with the IFTTT web server. The help of GSM module calls and message with the location.

IV. RESULTS & DISCUSSION

Serial UART channel-0 of node MCU is used for inter node MCU and sim900 communication. Communication is carried out at 9600 bps. Arduino IDE is used for writing and compiling code. In the setup function serial channel is initialized. In loop function AT commands are send to GSM. Note the format of cell number to which SMS is required to be send. At the end of the loop function while (1) function holds the control forever. If while (1) is not present there loop function

will continuously run and SMS will be send to receiver continuously. For further modifications one can insert a button in circuit and whenever the button is pressed SMS will be send out OR one can utilize the Wi-Fi of nodeMCU esp8266-12e chip and whenever a certain condition is meet over WiFi, nodeMCU triggers IFTTT server and it shots out an SMS. NodeMCU works on 3.3 volts. Whereas GSM module works on 5 volt power supply. Since both the modules work on different TTL levels there for commands and messages from each module first must be converted to receiver operational TTL level before reaching them. TX pin of node MCU sends signals out at 3.3v TTL level. The 3.3v TTL signal is converted to 5v TTL signal before reaching GSM module. First transistor converts the TX signal to 5 volt output but the output is inverted. Inverted output is input to second transistor. Which converts the inverted output to original signal with TTL level up to 5v. The output TTL signal is received by the RX pin of GSM module. Tx of GSM is connected to node MCU with level simple level shifter circuit in between.

Fig 3 HTML location tracking output

The message sent to the registered numbers contains the link of the location tracking. After clicking the URL, the webpage of Google maps with the current location of the person with device. Virtual implementation of the same is displayed in the figure below

Fig. 4 Virtual implementation using Proteus software

V. CONCLUSION

The proposed security gadget for women's safety comprises of Node MCU, interfaced with GPS and GSM modules. A simple web page is created using HTML which continuously communicates using smart phone with internet access. When the push button is pressed GPS tracking is enabled and alerts are sent to registered mobile number, along with the link of the webpage that displays latitude, longitude and time. This action enables help instantaneously and the victim can be found with greater accuracy. Our project is not only women centric but is useful to everyone who needs safety. Affordable gadget which can be used for someone's safety is something we need in today's generation. The victim just have to press the button twice to send the alert message to registered mobile number and a message along with your location has been sent immediately.

REFERENCES

[1] Trisha Sen, Arpila Dutta, Shubham Singh, Vague Naveen Kumar "implementation of an IoT based 3 way women safety device", IEEE Xplore ISBN:978-1-7281-0167-5,[ICECA 2019]

[2] Abhijit Paradkar, Deepak Sharma, "All in one intelligent safety system for women security", International Journal of Computer Applications (0975-8887), Volume-130 No.11, November 2015.

[3] Kalpana seelam, K prasanti "A novel approach to provide protection for women by using Smart Security Device", IEEE Xplore ISBN:978-1-5386-0807-4 [ICISC 2018].

[4] Vivek Kumar Sehgal, Ashutosh Soni, Lucky Rajput, "Smart human security framework Using IoT, cloud &fog computing", Intelligence distributed computing, advance in intelligence and computing system 321DOI: 10.1007/978-3- 319-11227-5_22, Switzerland 2015.

[5] C Priya, Ramya C, Beny D, Harini G, Shilpa S,Shivani Kiruthiga, "One touch alarm for women's safety using Arduino", International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN:2278- 3075,Volume-8 Issue6S, April 2019.

[6] Jiewen Zheng; Inst. Of Med. Equip., Acad. Of Mil. Med. Sci., Tianjin, China ; Guang Zhang ; Taihu Wu, Design of Automatic Fall Detector for Elderly Based on Triaxial Accelerometer ; Bioinformatics and Biomedical Engineering , 2009. ICBBE 2009. 3rd International Conference, IEEE Beijing.

[7] Medical alert systems with TeleHealth & telemedicine monitoring using GSM and GPS technology, IEEE Conference, Coimbatore, 2012.

[8] May, Z.B. ; Dept. of Electr. & Electron. Eng., Univ. Teknol. Petronas, Bandar Sri Iskandar, Malaysia. Real-time alert system for home surveillance, Control System, Computing and Engineering (ICCSCE), 2012 IEEE Conference Penang.

[9] Rana, G.M.S.M. ; Khan, A.A.M. ; Hoque, M.N. ; Mitul, A.F. Design and Implementation of a GSM based remote home security and appliance control System; Advances in Electrical Engineering (ICAEE), 2013 Control System, IEEE Conference Dhaka

[10] Borges,L.M. Inst. De Telecomun.-DEM, Univ. da Beira Interior, Covilha, Portugal Barroca, N. ; Velez, F.J. ; Lebres, A.S., Smart-clothing wireless flex Sensor belt network for foetal health monitoring; Pervasive Computing Technologies for Healthcare, 2009. PervasiveHealth 2009. , IEEE, London

[11] Rahdar, R. ; Bell Helicopter, Fort Worth, TX, USA ; Stracener, J.T. ; Olinick, E.V.; A Systems Engineering Approach to Improving the Accuracy Of Mobile Station Location Estimation; Systems Journal, IEEE (Volume:8 , Issue: 1 ,2013)

[12] Alwan, M. ; Dept. of Pathology, Virginia Univ., Charlottesville, VA ; Rajendran, P.J. ; Kell,S. ; Mack,D. , A Smart and Passive Floor-Vibration Based Fall Detector for Elderly; Information and Communication Technologies, 2006. ICTTA '06. 2nd (Volume: 1), IEEE Damascus

[13] Dr.Velayutham.R, Sabari.M, Sorna Rajeswari.M,"An Innovative Approach for women and children's security Based Location Tracking System" 0n International Conference on Circuit, Power and Computing Technologies IEEE [ICCPCT] 2016.

[14] Dhole, "Mobile Tracking Application for Locating Friends Using LBS", International journal Innovative Research in computer and Communication engineering, vol: 1, Issue: 2, April 2013.

This page is kept blank intentionally

Design of Smart Helmet for Visually Impaired

Sahil Bhagat
Department of Electronics Engineering,Thakur college of Engineering and Technology
Mumbai,India
s.sahil2322@gmail.com

Sourav Nayak
Department of Electronics Engineering,Thakur college of Engineering and Technology
Mumbai,India
nayaksourav38.sn@gmail.com

Abhishekraj Prasad
Department of Electronics Engineering,Thakur college of Engineering and Technology
Mumbai,India
ap75069@gmail.com

***Abstract*—A prototype, Smart Helmet, is proposed in this paper to help visually impaired persons recognize common real-life objects such as a human, vehicle, cat, dog, bottle, etc. Our system uses Computer Vision Object Recognition to recognize objects, Text to-Speech to provide audio output about what object is in front of the user and GPS for home and SOS navigation. The Prototype, along with the Pi Camera and GPS Module, is implemented using a Raspberry Pi machine. The primary objective of this project is to assist the user to define the object in real time.**

Keywords— **Visually Impaired, Computer Vision, Text-to Speech, GPS, Raspberry Pi, Pi Camera, GPS Module**

I. INTRODUCTION

Visual impairment, also referred to as vision impairment or loss of vision, is the impaired ability to see to a degree that causes problems that, such as glasses, are not normally fixable. Some also include those in early stages of impaired vision who have no access to glasses or contact lenses. The word blindness is used for complete or almost complete vision. Visual disability is not blindness. Visual impairment can cause problems with ordinary daily activities such as walking, reading, driving, and socializing for individuals.
Visual deficiency depends heavily on sensory organs to distinguish items that are useful but not effective. When a person is detected, a visually impaired person may recognize a person on the basis of his or her speech, but the voice can be imitated, which may mislead the visually impaired individual. Through running object detection and facial recognition, our system can recognize an individual.

II. REALTED WORK

A. Obstacle Detection Algorithm

This algorithm is based on the 3D image of depth obtained from the RGB-D camera and the angles of attitude obtained from the sensor attitude angle. Instead of increasing the threshold, in order to boost detection accuracy, the Sobel image edges and area boundaries are appropriate for consideration in the algorithm. Seeds are selected according to the image edges, and the rising stops apply to the image edges of Sobel and the growing threshold.

B. Ultrasonic sensor

Centered on an AT89C52 microcontroller, this cost-effective guidance system is designed to facilitate visually impaired vision. To measure the distance of the obstacles around the user, ultrasonic sensors are used to direct him/her to a safe path. Output is in the form of voice commands that can be heard from an audio output by the visual impaired, e.g., right, left, etc. There is also an advanced mode in which objects can be identified by the device using image processing algorithms.

C. Camera for navigation

This paper discusses a new solution to an ambient navigation system that would help indoor navigation (house, office, etc.) without any help for the visually impaired or blind. The device consists of IP cameras mounted to each room's ceiling and the subject's smart phone is used as the human machine interface (HMI). Frames are sent to a computer that analyzes, identifies and recognizes objects from the environment. A guidance algorithm for computer vision is designed and used to assist the user with obstacle detection to reach his desired destination. Feedback (alerts, route) is the output of voice messages to the user via the application. This scheme offers a reliable solution to help users avoid obstacles in their indoor environment, providing them with a secure path.

D. Text Recognition using Smart phone

A device that uses existing technologies such as Optical Character Recognition (OCR) and Text-to-Speech (TTS) on an Android smartphone to automatically recognize and understand text and signs in the environment and to help users navigate. In order to identify signs, rewrite sentences and translate them to speech, the proposed device uses a combination of computer vision and Internet access on an Android smartphone.

E. Virtual White crane

The Virtual White Cane simulates a cane using a laser pointer and a smartphone. The laser aligns to create a baseline and pan angle with the camera.
The camera catches the reflection of the laser from the planar surface, which becomes an input to a smartphone application that calculates the distance of the target from the user using active triangulation. The application then utilizes the vibration of the smartphone to alert the user to the proximity of the object. An Android Smartphone coupled with a laser pointer is held by the

user. The interface simulates a vibrating white cane in the presence of obstacles that the user points to. The metallic structure pairs the laser pointer with the smartphone of the customer. As the laser points to an object in the vicinity of the user, Active triangulation is used by mobile apps to calculate The distance of the object and induces vibration from the smartphone. The vibration speed increases as the object gets closer.

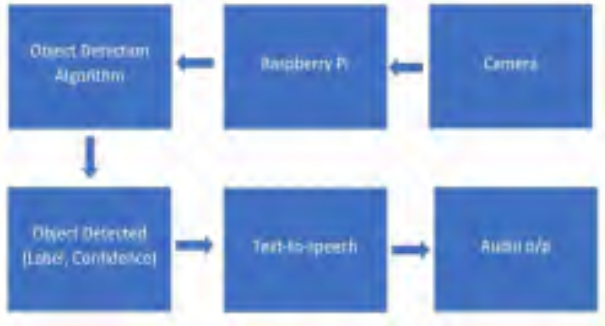
F. Vibratory Belt

A Kinect camera consists of the Vibratory Belt Inertial, connected to an embedded computer The unit of measurement (IMU) and three small vibrating units Engines. The camera has images of depth and the camera has images of depth. The machine measures the distance between the nearest obstacles. In front of the consumer in three places. In order to differentiate the IMU measures the objects from the floor, the camera's Orientation. Obstacle detection by waistline vibrations across the waistline. Three-engine belt; an embedded computer and a Kinect from a sensor. The Vibratory Belt is quick to use and does not block hearing and sensing barriers at head level. But generally, it is used only for indoor operations or controlled surroundings.

III. PROPOSE METHODOLOGY

A. Basic System Flow

The basic flow of Object Detection is shown in Figure 1.System processing. The camera records the video live. And stream it and give it to the Pi Raspberry. The Pi of the Raspberry Enters the stream of video and runs it through the object Algorithm of detection that identifies and recognizes items As a class, and to translate objects as objects using text-to-speech Output Audio.

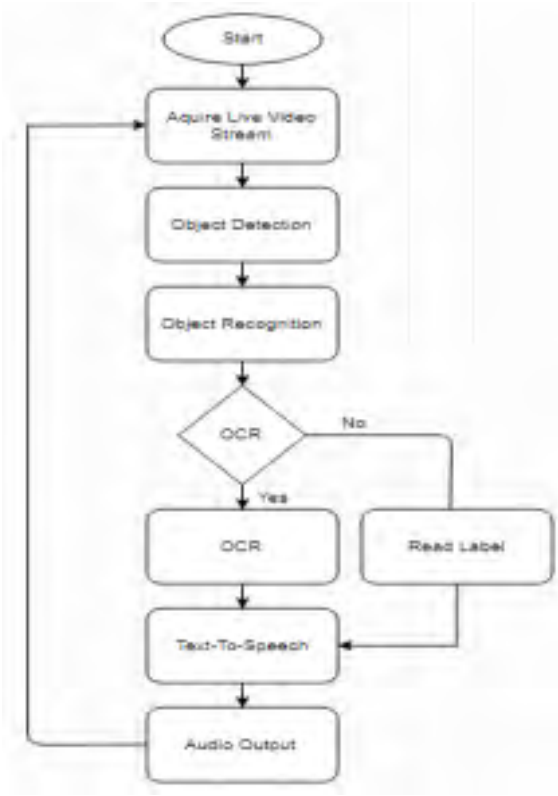


B. Block Diagram

The block diagram of the device is depicted in Figure 2.The machine consists of a Raspberry Pi Power Supply, Pi Camera,4G Dongle and Stress Button, GPS Module.

The Raspberry Pi used is a Type B+ 3rd generation with 1.4GHz ARM Cortex-A53 Processor, 1GB SRAM. The supply of power supplied to the Raspberry Pi is 5V 2.55.By linking the Pi Camera v2 to the Raspberry Pi Via the ribbon cable port on the Raspberry Pi the Pi Camera cord. A GPS module is equipped with a Power supply of 3.3V from the 3.3 V VCC and GND GPIO On the Raspberry Pi, the pins. And the GPS TX and RX The module is connected to the GPIO pins RX and TX on the Pi Raspberry. The 4G Dongle, which is going to supply the Internet access to the machine is related to the system. Using the USB port with the Raspberry Pi. The document is ready after the text editing has been done. Because of the template. Duplicate the template file using the template file Save As and use the Naming Convention command. The name of your paper was prescribed by your meeting. In Highlight all of the contents and content of this newly created file Get your prepared text file imported. You're set for style now. Using the scroll down window on the left of the MS file.

C. Object Detection Flow



The flow of the system is described in figure 3. It starts with Acquiring the Pi Camera Live Video Stream and Passing it on to the algorithm of object detection, where the algorithm it detects and recognizes objects. Once it is the objects Recognized, the framework verifies if artifacts require OCRR.The processing of OCR is needed for artifacts such as road signals, signs for traffic and signs for work ahead. If an entity the objects detected require OCR and are processed for text. with extractions. The Text-to-speech after extracting the text Converts text to the output of audio. If not the object the device only translates the labels to audio and includes OCR.

IV. TECHNOLGY USED

1. Software

A. Object Detection

Object detection is a machine vision and image branch of processing that deals with detecting semantic instances A certain class of objects (such as cats, dogs, humans, Buildings, or cars) in photographs and digital videos. The Object in many fields of computer vision, recognition has apps, Image retrieval and video surveillance are included.

B. Open Cv3

OpenCV (or Computer Vision Open Source) is a library targeted at computer vision in real-time. We are going to use OpenCV3 along with the caffe platform for deep learning model for Object Detection implementation.

C. GPSD

GPSD is a daemon that obtains information from a GPS receiver and supplies the data back to different applications such asas applications for GPS navigation. This offers an united connect with receivers of various forms. It uses GPSD to extract GPS (latitude and longitude) coordinates from the GPS Module for User Monitoring.

D. SMS Gateway

An SMS Gateway allows sending and receiving by a device SMS messages to and from a computer capable of SMS through the global Network of Telecoms (normally to a mobile phone).An SMS gateway is used to send SOS messages from the server. In the event of an emergency, the machine.

2. Hardware

A. Raspberry Pi

The Raspberry Pi 3's B+ model is being used as its ARM the 1.4 GHz Cortex-A53 processor and 1 GB SRAM are reliable. For performing algorithms for object detection along with for GTTS, GPS, SMS and more, more sorting. It's also for this application, size makes it acceptable as the device is it was intended to be mobile.

B. Pi Camera V3

The 8-megapixel Sony IMX21919 v2 Pi Camera v2
the image sensor is a custom add-on board designed for Raspberry Pi and is used for live video input to provide Raspberry Pi for Detecting Objects.

C. GPS Module

To track users, the Neo-6M GPS Module is used by
Live location extraction from the module and
It's processed via a Pi.

V. ADVANTAGE

1) Detection of objects by up to 15 objects per frame
2) You can send SOS messages to registered mobile phones numbers, together with the present location of the user.
3) Direction to home, direction to home with audio from the current location, both for walking and for depending on the mode of public transit, based on the spacing, distance.

VI. LIMITATION

1) The machine has a lag of 2-4 seconds due to the Raspberry Pi's processing limitations.
2) Neo-6M is accurate to 2.5-10m depending upon the surrounding.

VI. CONCLUSION

Using Object Detection on Raspberry Pi to help users recognize real-life objects in real-time, we have implemented the smart helmet. For the customer, the machine often functions as a way-to-home and an SOS messenger. Our system is a stepping stone to a visually impaired system that is more advanced. Our system's advances would result in low latency, higher processing speed, greater accuracy, greater performance, more functionality such as notifications to live locations, etc.

REFERENCES

[1] Ruiqi Cheng , Kaiwei Wang , Kailun Yang , Xiangdong Zhao , *State Key Laboratory of Modern Optical Instrumentation, Zhejiang University, China. “A GROUND AND OBSTACLE DETECTION ALGORITHM FOR THE VISUALLY IMPAIRED”

[2] Zewen Li, Gang Luo and Shrinivas Pundlik , “Stabilization of Magnified Videos on a Mobile Device for Visually Impaired”, IEEE Conference on Computer Vision and Pattern Recognition Workshops, 2018.

[3] Varit Prudtipongpun , Thorntita Rattanapongsen , Wirawan Buakeaw andMingmanas Sivaraksa , ”Indoor Navigation System for Vision-impaired Individual”, IEEE-International Conference on Signal-Image Technology & Internet-Based Systems (SITIS), 2015.

[4] David Zhou, Hanbing Yan and Yonggao Yang ,”A smart “virtual eye” mobile system for the visually impaired”, IEEE Potentials, 2016.

[5] Il Yong CHUNG, Kang Hyeon RHEE and Sanghag Kim, ”The Smart Cane Utilizing a Smart Phone for the Visually Impaired Person”, IEEE 3rd Global Conference on Consumer Electronics (GCCE), 2017.

[6] Eduardo Ghidini , Isabel H. Manssour , Wagner D. L. Almeida and MileneS. Silveira,” Developing Apps for Visually Impaired People: Lessons Learnedfrom Practice”, 49th Hawaii International Conference on System Sciences, 2019.

This page is kept blank intentionally

Design of Water Quality Monitoring system of Fish Farm and Analyzing Data of system

Rushikesh Khochare
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
rushikeshkhochare81@gmail.com

Prabhunath Yadav
Electronics Department
Thakur College of Engineering and Technology
Kandivali (East),
Mumbai - 400 101
Prabhu19982@gmail.com

Ramashish Sahani
Electronics Department
Thakur College of Engineering and Technology
Kandivali (East)
Mumbai - 400 101
ramashishsahani786@gmail.

***Abstract*—Water quality is an important parameter for fish farming. Differences in factors such as inputs, climate, management, technology, markets, social environment, and institutions might be reasons for the disparities in growth. India is also an important country that produces fish through aquaculture in the world. India is home to more than 10 percent of the global fish diversity. Presently, the country ranks second in the world in total fish production with an annual fish production of about 9.06 million metric tonnes.The requirements of water changes with the type of fish we want to breed. Sometimes changes in the quality of water happen all of sudden and it is very harmful to the aquaculture. So we are designing a system that monitors the parameters of water such as temperature, PH value, turbidity and total dissolved solids (TDS).It also records data in a database that can be used for data analysis like dashboard and comparison of data. If a sudden change occurs in the water parameter then the system will notify the user so that the user can take necessary action on it. The user can see previously collected data and do the analysis and make the necessary changes.**

Keywords—Internet of Things (IOT), water monitoring sensors, fish farming, monitoring water quality

I. INTRODUCTION

A. The DS18B20 is a 1-wire programmable Temperature sensor from Maxim integrated. It can measure a wide range of temperature from -55°C to +125° with a decent accuracy of ±5°C.

Fig.1 Temperature Sensor

B. Analog pH sensor is designed to measure the pH value of a water and show there acidity or

The term aquaculture broadly refers to the cultivation of aquatic organisms in controlled aquatic environments for any commercial, recreational or public purpose. Aquaculture serves many purposes, including: Food production for human consumption; Rebuilding of populations of threatened and endangered species; Habitat restoration; Wild stock enhancement; Production of baitfish; and Fish culture for zoos and aquariums. In aquaculture maintaining the water quality is one of the important factors and most important parameters which need to be maintained in water are pH value, temperature, turbidity, tds,etc. So these parameters must be maintained to avoid the problem in aqua-farming like delay in growth, mortality, diseases etc. Measuring the water is one of the major problems faced by farmers; many of them used traditional methods of collecting the sample and test in the lab.This process cost a lot of time, money and manpower. This is where real time monitoring is crucial, this project helps to continuously read and store the parameter of water, it also stores the data in a database and also farmers can access the data easily.

II. PROPOSED FRAMEWORK

The following set of Sensors/Actuators which are used in the system design are listed as follows:

1. Microcontroller (Arduino atmega328p)
2. Temperature sensor(DS18B20)
3. Analog pH sensor
4. Turbidity sensor
5. Total Dissolved solids(TDS) sensor
6. NodeMCU ESP8266 wifi module

alkalinity. The pH value ranges from 0 to 14. pH between 0 to 6 is acidic and 8 to 14 is basic in nature. pH 7 is neutral.

Fig.2 Analog pH Sensor

C. The turbidity sensor detects water quality by

measuring the levels of turbidity, or the opaqueness. If turbidity in water is more then it will harmful for aquaculture.

Fig.3 Turbidity sensor

D. TDS (Total Dissolved Solids) sensor is used to measure the how soluble solid particles are present in the water. If TDS value is more then water is not clean, if it is less then water will be more clean.

Fig.4 Total Dissolved Solids (TDS) sensor

E. The hardware of the project comprises NodeMCU ESP8266, which uses 128kB of memory and has a storage capacity of 4Mbytes. This module is used for data transmission from arduino to database.

Fig.5NodeMCU ESP8266 wifi module

F. ATmega328 is microcontroller used in this project. All the four sensors are compatible with Arduino. Sensors will send data to Arduino and microcontroller will process the data for further use.

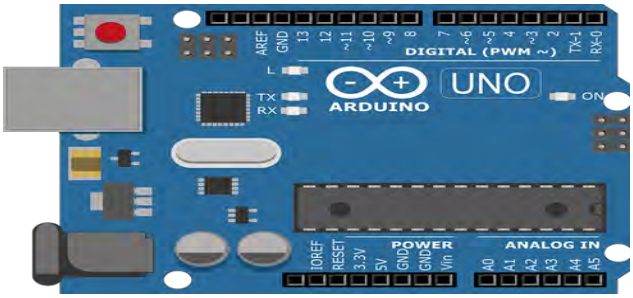


Fig6 Arduino Board

Following software components are used:

1. Database
2. Graph
3. Website

A. Database

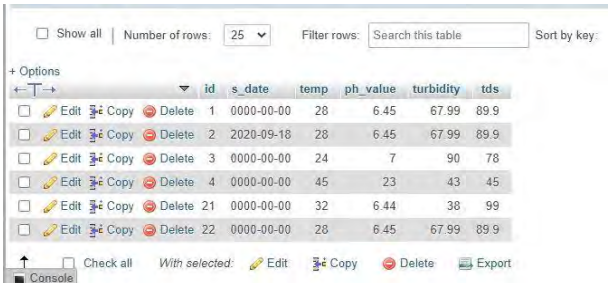


Fig.7 Database

B. Graph

Fig.8 Graphical data

C. Website

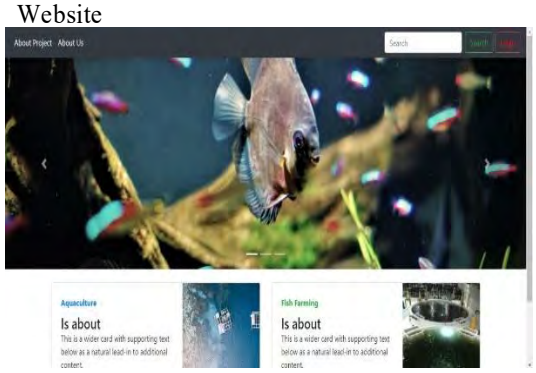


Fig.9.website

\

III. PROPOSED ARCHITECTURE & METHODOLOGY

The idea is to implement a system that will make the work of measuring the parameter simple and easy. The system is based on the IOT technology. . It consists of a sensor, microcontroller, database and user interface (website). This system shows data individually, collectively as well as in graph format means as graph. This system helps the farmer to monitor the parameter of water from anywhere and anytime with the help of the internet. It records data of several months so fish farmers can study it and make appropriate plan. It also gives email to users if any parameter exceeds or decreases from standard parameters of water.

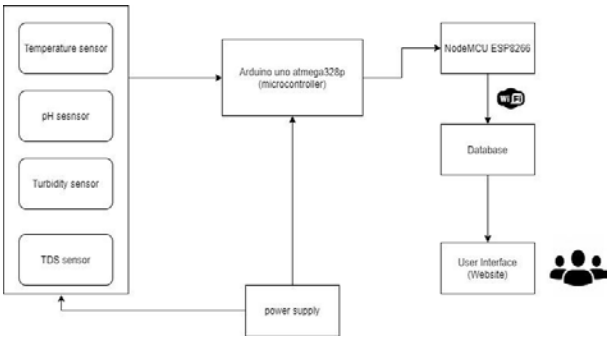


Fig 10. Block Diagram of the system

1. All the sensors will have the water parameter data like pH, temperature, turbidity and TDS value of water.
2. Arduino will process the collected data and then transfer it to the database using NodeMCU.
3. Web Page is created at the user interface to enhance the end user experience.
4. Database will store all the collected data which is useful for further analysis.

IV. LITERATURE SURVEY

- Fish farming is a challenging job for producing fish without any hazard. Water quality monitoring will notify user about water parameter changes.
- This article establishes an automated monitoring system for the fish farm aquaculture environment. The fish farm setting is usually in convenient places without common place traffic.
- The conventional method of testing water quality parameters is to take water sample to the lab and do the testing of parameters like pH, Turbidity, TDS value, it is time consuming. Hence to reduce the manpower and save time water quality monitoring is done using various sensors.
- If any of the water parameter is exceeded beyond standard range then system will notify user. Objective is to notifying user about water quality parameters.

V. DESIGNING MODEL

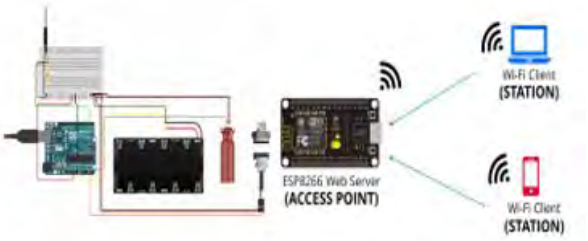


Fig.11 Diagrammatic Representation

[1] Sensing the parameters

This process involves making use of sensors as a sensing element to sense the desired water parameters such as the sensor DS18B20 detects temperature of the water, Analog pH sensor detects pH value of the water, Turbidity sensor detects purity of the water, TDS (total dissolved solids) sensor detects ionized solids in water so we can estimate conductivity of the water.

[2] Conversion of the Input signal coming from the sensors into voltage/value.

This step involves conversion of the given input signal coming from the output of 4 sensors and converting it into desired value which can be used to do the further analysis and we can get necessary information.

[3] Setting the Alert system ON once parameter value crosses threshold value.

If any of the water parameters crossed its threshold value, so it can be harmful for aquaculture. Hence the alert system is implemented. In that condition the system will send an email to the user so the user can take necessary action on it.

[4] Sending the Data over the database via Wi-Fi module

In this process the NodeMCU will keep on sending data which is made available to it via sensors to the database at an interval rate which is set/defined by the user.

[5] Display of data of the sensors on Website

The output of the sensor is displayed on the website so that users can check the previous data anywhere and anytime. Users can also do the analysis of previous data and do the changes in the system accordingly.

VI. APPLICATIONS

A. Monitoring of surrounding rivers and lake

For aquaculture organisms proper water is needed means the value of turbidity, temperature, total dissolved solid, dissolved oxygen, ammonia and hardness of water should be in moderated amount. This system can help to keep monitoring of rivers and lakes.

B. Fish farming.

Fish farmers face hard time during checking the parameter of that is both costly and time consuming. This system provides important parameters of water that are needed for fish farming.

C. Data Analysis.

In this age the data is very important and data analysis

is being done on every important data in order to extract useful information. This information can be used for research purposes and to improve productivity.

VII. RESULTS

With the implementation of the product described in this paper, the aim is to efficiently monitor the water parameters and display the data on the website. And if any parameter changes above there threshold value then it will notify the users via Email alert.

VIII. FUTURE SCOPE

Water quality monitoring system can be used in many applications with some modification. We can implement same idea for pearl farming. We can add more sensors to study the water quality more deeply. Same idea can be implemented for drinking water testing. We can use same idea in agriculture industry such as Ph sensor is use to measure the Ph value of soil.

ACKNOWLEDGMENT

Our project, 'Design of Water Quality Monitoring system of Fish Farm and Analysing Data of system' has been possible because of our teacher and project guide Mr. Vaibhav Gijare (Assistant professor ELEX) who provided us with guidance and motivation throughout its making. We thank him for giving us an opportunity to create this project. We are also thankful to Dr. S.C Patil (Electronics Department, HOD) for his guidance and to our parents for providing all possible resources to gain the best possible knowledge. Finally, we would thank our college 'Thakur College of Engineering and Technology' for providing us with a platform and the necessary facilities to make this project.

REFERENCES

[1] Wen-Tsai Sung*, Jui-Ho Chen, Hsi-Chun Wang Remote fish aquaculture monitoring system based on wireless transmission technology **DOI:** 10.1109/InfoSEEE.2014.6948171

[2] Md Masum Billah, Zulkhairi Mohd Yusof Izanoordina Ahmad#3 Quality Maintenance of Fish Farm: Development of Real-time Water Quality Monitoring System Proc. of the 2019 IEEE 6th International Conference on Smart Instrumentation, Measurement and Applications (ICSIMA 2019)

[3] Brinda Das, P.C. Jain Real-Time Water Quality Monitoring System using Internet of Things 2017 International Conference on Computer, Communications and Electronics (Comptelix) July 01-02, 2017

[4] Bakhtyar Maghdid Hussain1 , Wrya Muhammad Ali Monnet2 3rd International Engineering Conference on Developments in Civil & Computer Engineering Applications

[5] Supriya R. Khaire Revati M. Wahul Water Quality Data Analysis and Monitoring System in IoT Environment 3rd International Conference on Contemporary Computing and Informatics (IC3I)

[6] Design of Smart Sensors for Real-Time Water Quality Monitoring JOURNAL OF LATEX CLASS FILES, VOL. 13, NO. 9, SEPTEMBER 2014

[7] https://www.electronicscomp.com/ds18b20-water-proof-temperature-sensor-probe-india?gclid=Cj0KCQiA0rSABhDlARIsAJtjfCcafczDotB9WFzGtglp8V2B1pdNz7ppaSOVQh_7WO7n-a2g8iGa6oUaArt2EALw_wcB

[8] https://wiki.dfrobot.com/Analog_pH_Meter_Pro_SKU_SEN016

Development of UV Sterilization System

Soham Mahajan
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East), Mumbai - 400 101
soham.mahajan07@gmail.com

Nidhi Rajpurohit
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East), Mumbai - 400 101
nidhi.rajpurohit@gmail.com

Akhila Shetty
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East), Mumbai - 400 101
akhilashetyy879@gmail.com

***Abstract*— There are many effective ways available to sterilize human body but what about the things we touch frequently? Nowadays, as far as COVID-19 situation is concerned, the sanitization of places like hospitals and other public places is very important. UV-C can reduce the risk of infection by airborne microorganisms hence it is being proposed to be used in sterilization of hospitals and in various fields. As compare to UV-A and UV-B, UV-C has smaller volume which does not create much heat hence meeting the necessity of green energy. The light is hence most suitable for sterilization and purification which is helpful in destroying organisms like bacteria and viruses. The doses of UV-C radiation completely depends upon the organism and the surfaces in presence. The system is constructed using UVC tubes with the wavelength of 230-260 nm and the energy intensity 10-204 mJ/cm^2 but UV-C radiations can have severe damages to human body. Hence, it is necessary to build a machine which can be controlled from outside the operating zone. The unit being proposed is remote controlled and will provide live video streaming of the operating area. The UV-C light rays will help us achieve 99.9% sterilization of the surfaces in hospital rooms.**

Keywords—UV-C Dosage, Exposure time, Radiation Intensity, Sanitation, Sterilization, Cleanliness Guidelines, Disinfection, Mechanical unit, Raspberry Pi.

I. INTRODUCTION

Around 6.3 million people in Mumbai alone live in slums without knowing the importance of sanitation. Generally they do not take ssanitation seriously because these people don't even know the importance of it. The spread of communicable diseases cannot be controlled.
There are no measures taken to sterilize the areas where the number of affected people visit frequently. The basic sanitation coverage went up from 38.7% in October 2014 to 93.3% in 2019. That is a considerable change.
In the race to find an effective solution that can be helpful to avoid COVID-19, we are proposing this project idea as ultraviolet light is proven to be a strong contender. This project basically provides a solution based on the popular UV sterilization method for medical applications.
Exposure to UV-C light of 254 nm for a period of 10 minutes was found to deactivate the SARS-CoV1 virus by being effective in altering the cell structure.
The UV-C light is absorbed by the RNA and DNA in cells and it induces such changes which result in inability to replicate.
This project aims to promote hygiene and provide an efficient tool which is economical and has low cost for manufacturing and deployment.

II. PROPOSED FRAMEWORK

A set of major components which are used in the system design are listed as follows:

1. UVC Tubes
2. Raspberry Pi
3. Motors
4. Wi-Fi Router
5. Webcam
6. Lithium ion Battery
7. Mini inverter

1) UVC Tubes*:* The UVC Tubes are used for killing or inactivating bacteria, viruses and other primitive organisms. Typical application includes the disinfection of drinking water.

Fig.1. UVC Tubes

2)Raspberry Pi: The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse also capable to explore computing, and to learn how to program in languages like Python.

Fig.2. Raspberry Pi

3) DC Motor: A motor is a machine that converts electrical energy to mechanical energy.

Fig.3. DC Motor

4)Wi-Fi Router: A wireless router is a device that performs the functions of a router and also includes the functions of a wireless access point. It is used to provide access to the Internet or a private computer network

Fig.4. Wi-Fi Router

5) Webcam: A webcam is a video camera that feeds or streams an image or video in real time to or through a computer to a computer network, such as the Internet.

Fig.5.Webcam

6) Battery: Lithium ion battery is a twelve-volt battery which has six single cells in series producing a fully charged output voltage of 12.6 volts.

Fig. 6. Battery

7) Mini Inverter: The Mini Inverter is a UL Listed stand-alone pure sine wave (250W and up) output inverter designed to provide power to designated emergency lighting fixtures. In a power loss situation, it will supply power from the onboard battery supply.

Fig.7. Mini Inverter

III. PROPOSED ARCHITECTURE & METHODOLOGY

1. **UVC tubes:** The technology of UVC is being selected due to it's advantages including longer life, long light decay time, adjustable luminous efficiency, clear light source illumination angle without mirror effect, strong sterilization penetration, etc. UVC is hence suitable for use as a light source for medical sterilization and environmental disinfection and purification.

2. **Architecture:** The machine has two units. The top unit and the bottom unit which are totally dependent on the instructions given by the user. Bottom unit has the function to drive the machine and top unit has the fixtures of UVC tubes that will make the sterilization easy because of the movement of tubes.

3. **Webcam and Wi-Fi router:** The design we are suggesting will have live video streaming using Raspberry Pi and Wi-Fi module. The streaming can be done using any browser or mobile screen in real time for the movement of the system in the room. The motion detector algorithm will be written in python which will be efficient for storage space. Hence the hardware area will be completed using a USB camera and the algorithm required along with necessary peripherals.

4. **Motor Driver:** The Wi-Fi configuration with Raspberry pi is used for checking the control and the movement is determined by the user and hence the motor driver is responsible for driving the system.

5. **Actuator:** An actuator here will a device convert the control signal into mechanical motion and cause the sterilization to be done with a 360° motion

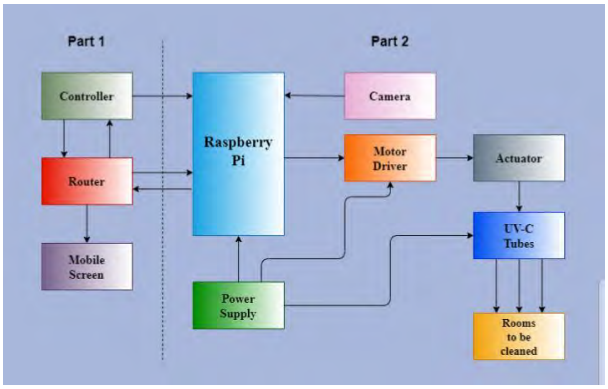


Fig.8. Block Diagram

IV. LITERATURE SURVEY

Statistics obtained from the survey are summarized as follows:

a. a. Regarding UVC dosage, the exposure time and the inactivation rate is of main concern. With the research it was brought to light that satisfactory inactivation was a non-linear graph in contrast to the linear graphs

provided by different solutions available regarding this problem.

b. While emphasizing guidelines using UVC light it is also recommended that appropriate distance is maintained along with the appropriate exposure time. The sterilization of burn operating room is the most important along with the instruments used since it comes in contact with the mucous or skin membrane. The sterilization is hence dependent on the light source and the area being sterilized.

c. However, the reality remains that higher the UVC radiation intensity shorter will be the sterilization time. Maintaining this fact it can be noted that less radiation intensity but for short time has the same effect as high radiation intensity but for a short time.

d. Efficient UV Light sanitization is not being practiced in hospitals and clinics. Modern Sterilization Equipment should be in use (Example: UV Light Sterilizer.) This will help in better and efficient sterilization. Not making the proper strength of disinfectant and absence of infection control points in the protocol are two important points that need to be highlighted. Poor adherence to post disinfection guidelines leads to poor sanitation. Selection of disinfection materials and the method of disinfection should be given very careful attention. Keeping in the mind the current Covid-19 situation, the hospitals should abide by the guidelines and hence follow them strictly to maintain the cleanliness and hygiene of the area or surroundings.

e. There is a different procedure available to send or transmit real time video data. It requires processing, storing and sending the data forward using particular technology. With Raspberry Pi module it is possible to transmit Video by capturing it using any webcam compatible with Raspberry Pi module. But, Raspberry Pi won't allow capturing audio data with the same port which is available for video transmission so we can use different ports for different inputs like audio data. There are some steps to be followed for enabling the camera. After following those steps, data can be transmitted using Raspberry Pi to any screen which is further connected to the setup. Raspberry Pi is 40 times faster than Arduino UNO and can work efficiently in the UVC device as the brain of the system.

f. An ultraviolet germicidal irradiation (UVGI) generator (the TORCH, ClorDiSys Solutions, Inc.) was used to compare the disinfection of surface coupons (plastic from a bedrail, stainless steel, and chrome-plated light switch cover) in a hospital room with walls coated with ultraviolet (UV)-reflective paint (Lumacept) or standard paint. Each surface coupon was inoculated with methicillin-resistant Staphylococcus aureus (MRSA) or vancomycin-resistant Enterococcus faecalis (VRE), placed at 6 different sites within a hospital room coated with UV-reflective paint or standard paint, and treated by 10 min UVC exposure (UVC dose of 0–688 mJ/cm2 between sites with standard paint and 0–553 mJ/cm2 with UV-reflective paint) in 8 total trials.

V. DESIGNING MODEL

1. **Mechanical Structure:**

The UVC Sterilizer is designed very slim to make the system move through beds kept in hospital wards. The Sterilizer system is having two parts: Upper and Lower Unit. The lower unit has the responsibility to drive the whole system in hospital rooms which is controllable by user. The function of upper unit is to change the face of tube with help of supporting tools used. Now, the design mentioned is the upper unit and lower unit of the system. There is a ring used as a supporting link in the design. The material we are using is mild steel. The weight of shafts should not exceed therefore, T-shaped rod and the other shafts are made with Aluminum.

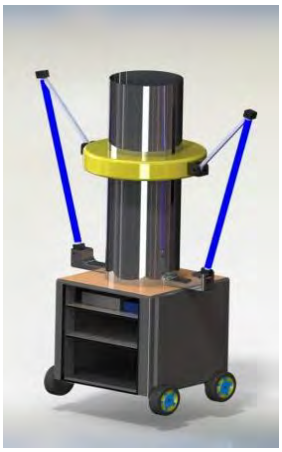


Fig. 9. Design of the model

2. **Live video streaming:**

This is very important feature of the machine as it is the only vision the user is able to access. The technology used in this streaming is VNC (Virtual Network Connection). SSH (Secure Shell) is used for getting access over the camera stream commands from Raspberry Pi micro-controller. The module and camera are connected and streaming the same video data on the visual screen in front of end user. The established connection in the micro-controller and the screen is done by using Wi-Fi technology.

3. **Remote controlled motion:**

The motion of the whole wireless unit is totally controllable using a remote controller which can be an mobile application with driving keys. Any mobile phone having the same Wi-Fi connection and the mobile application can be used for this. This allows the user to be protected from the exposure of UV-C light rays. Here, VNC plays an important role in controls.

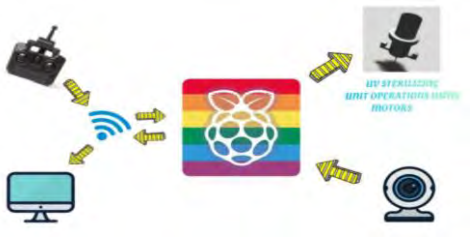


Fig. 10. Flowchart of the system

The user needs to connect the Remote Controller and the Raspberry Pi with the same Wi-Fi module. The controller transmits signal for controlling ON-OFF for the UV-C Tubes and for controlling ON-OFF for the motors to drive the unit to the desired place. Webcam turns ON and immediately starts transmitting video data to mobile screen through Wi-Fi.

VI. APPLICATIONS

1. Considering the COVID-19 situation this product is completely suitable for disinfection and as of long term application is considered disinfection in countries like India is really necessary due to the lack of equipment which are tech friendly and where traditional method like Basin and Mop is still being used.
2. The targeted regions of business are Hospitals and Clinics but, it can be operated at public places such Shopping malls, Marriage function halls, Sports arenas, etc.
3. Hospitals in India need to be updated with such equipment which will help in disinfecting and sanitizing the surrounding. On daily basis there are number of patients who visit many such hospitals and clinics and hence cleanliness is top most priority. For better sanitation, hospitals need to invest in this product.

VII. RESULTS

Nowadays, the sanitation of places like hospitals and other public places is very important. The UVC device that is proposed to design is used for hospital room-decontamination and allows for rapid, safe and automated disinfection of rooms. It is suitable to be used for sterilization of every corner of the room due to it's movement. The movement is being achieved by the controller from outside the room which also supports live video streaming and obstacle detection. This sterilizer works on the concept of the UVC light. This machine is an import substitute that is an alternative for the expensive UVC machines.

VIII. FUTURE SCOPE

The UVC Sterilization System is designed keeping in mind the COVID-19 situation. Hence, there is definitely room for improvements and betterment.

1. To use this system from a far away distance would make a great impact. Using API (Application Programming Interface) which is an intermediate software that allows two applications to communicate with each other, we can achieve this.
2. The batteries used in this system are Lithium Ion Batteries. For durability and long time use we can use Lithium Polymer Batteries. They can be used for longer life and compact size.
3. We have used a remote controller to control the entire unit. Improving that, a self-moving robot can be designed which will move on its own instead of the user giving it directions. This will be much more efficient, faster and durable.

ACKNOWLEDGMENT

This project cannot be entirely created by an individual. The timely completion of the project 'Development of UV Sterilization System' has been possible because of our teacher and project guide Dr. Sandhya Save who provided us with guidance and motivation throughout its making. We thank her for giving us an opportunity to create this project. We are also thankful to Dr. S C Patil (Electronics Department, HOD) for his guidance and to our parents for providing all possible resources to gain the best possible knowledge. Finally, we would thank our college 'Thakur College of Engineering and Technology' for providing us with a platform and the necessary facilities to make this project.

REFERENCES

[1] "Ultraviolet-C decontamination of a hospital room: Amount of UV light needed", Elseveir - Burns 46, 2019
[2] Tai-Ping Sun, Chung-Ta Huang, Ping-Wing Lui, Yi-Tai Chen5, Hsiu-Li Shieh, "Novel Measurement System for Linear Array Type UVC Germicidal System", IEEE Eurasia Conference on Biomedical Engineering, Health- care and Sustainability, 2019
[3] "Hospital Surface Disinfection", Journal of Hospital and Medical Management, 2018
[4] "Live video streaming using Raspberry Pi", International Journal of Engineering Research & Technology (IJERT), 2017
[5] "National Guidelines for Clean Hospitals", Government of India,2015
[6] Michelle M Nerandzic1, Jennifer L Cadnum1, Michael J Pultz1 and Curtis J Donskey, "Evaluation of an automated ultraviolet radiation device for decontamination of Clostridium difficile and other healthcare- associated pathogens in hospital rooms", BMC Infectious Diseases, 2010
[7] G Katara, N Hemvani, S Chitnis, V Chitnis, *DS Chitnis,"Surface disinfection by exposure to germicidal UV light", Indian Journal of Medical Microbiology, 2008
[8] "Mechanical design and simulation using SolidWorks", July 2013
[9] Ultraviolet (UV)-reflective paint with ultraviolet germicidal irradiation (UVGI) improves decontamination of nosocomial bacteria on hospital room surfaces, May 2017.

IoT based real-time School Information and Security System with Live tracking

Aishwary Chauhan
Electronics and Telecommunications
Thakur College of Engineering and Technology
Mumbai, India
chauhan.aishwary22@gmail.com

Shubham Choudhary
Electronics and Telecommunications
Thakur College of Engineering and Technology
Mumbai, India
sschoudhary20101999@gmail.com

Aniruddha Gharat
Electronics and Telecommunications
Thakur College of Engineering and Technology
Mumbai, India
gharataniruddha@gmail.com

Rashmita Kumari Mohapatra, Asst. Prof.
Electronics and Telecommunications
Thakur College of Engineering and Technology
Mumbai, India
Rashmita.mohopatra@thakureducation.org

Abstract: **With already existing technology revolving around Smart Security Systems based on RFID Technology, location tracking modules based on RFID modules and Information Systems implemented for IoT Administration – our project takes up an audacious goal of bringing various latest technologies together to build a future ready infrastructure that takes the existing products available in the market to the next level. This Digital Infrastructure offers multiple components that are coming together as an ecosystem to enhance student security and ease of information access for the people inside institutional campus. The infrastructure will include four major parts that are student in-campus tracking, bus location tracking, visitor tracking and information system. This ecosystem in comparison to its existing version available in the market brings latest standards in security and smart information systems together to make a product uniquely tailored to the Indian school realities and is designed with Market research based on Tier 2, State-board and Govt. School expectations and realities in consideration. The above components will be managed by a web-based data management system and web app enabling transfer of information to the necessary stakeholders, update real time location information and activity to admins and guardians, as well as work as an ERP module for school to host its educational materials, data and notifications on one unified platform for Students, Teachers and Guardians.**

Keywords: Information System, Internet of Things (IoT), Location Tracking, RFID, School Security System, Smart School Bus, Wearable Sensors

I. INTRODUCTION

Child security in the school grounds is significant in building a decent society. In and around the globe, kids are ill-treated and even kidnapped sometimes by individuals who are not in acceptable attitude in the school premises. The developing worries of families about the wellbeing and security of their kids incited a significant interest in creating strong systems that offer efficient supervision of youngsters commuting among homes and schools. To track and resolve such issues an enhanced security system is required [1]. Consequently, this paper proposes an upgraded form of security system and furthermore, expands its highlights into a savvy real-time information system by actualizing IoT system for kids. With the rise of the Internet of Things (IoT), Radio Frequency Identification (RFID), inventions of such systems got practical. In this paper, we present the plan and execution of a far-reaching minimal effort system dependent on IoT that permits schools, guardians to constantly monitor their wards while in school transports. The system depends on passive NFC readers that are introduced in school transports, close to transport stations, and at pick-up points at school campus.

With the world constantly moving towards computerization, as new innovations like 5G NR uRLLC, make super low latency monitoring and data transfer possible. The world is moving to truly utilize the capability of IoT and innovation in our regular day to day life. While the need of such systems may have been interrogated 10 years back, today we are moving towards a reality where organizations and society are more comprehensive and perceive the worth digital infrastructure can bring in day to day life.

In the event where there is no automation, the information is not stored digitally, accessing this huge amount of data is either troublesome or tedious. To access the data quick and precisely, a digital system is required. Presently, there are a lot of technologies that help in achieving that. Systems based on Radio Frequency Identification (RFID) are one of them and in this research, RFID is utilized. RFID is a term that is used to describe a system that transmits the details of an article as a unique tag with the help of radio waves.

The proposed work based on statistical surveying, risk and financial analysis, and the overall components utilized in the proposed project. Followed by this, there is a detailed practicality study to comprehend the scope of this project in various School Infrastructures. According to the research and scope - the paper proposes the project planning, schedule to make the project model ready and the final outcomes and conclusions based on the project work. The project hopes to incorporate most recent NFC

Standards into cost-effective wearable sensors, to overcome the issues existing in past models.

The rest of the paper is organized as follows: In section II, we present the literature survey. In section III, we discuss the proposed model. We discuss simulation and results in section IV. In section V, we provide the conclusion of our work.

II. Literature Survey

Near-Field-Communication (NFC) is a set of communication protocols for communication between two electronic gadgets over a short distance (4 cm) or less. NFC offers a low-speed association with basic arrangement that can be utilized to bootstrap more-capable remote connections. NFC gadgets can act as electronic identity documents. They are utilized in contactless payment systems. NFC can be utilized for sharing small files like contacts, and bootstrapping fast connections to share bigger files like photographs, audio or video recordings as well.

C.Deenadayalan, M.Murali and L.R.Baanupriya proposed a paper which is a blend of most recent innovations utilizing RFID, GSM, image processing, WSM, web-development using Php, VB.Net language, apache web server and SQL[1]. Fundamental idea of this paper is to get information about the students, like in and out time from the transport and campus will be recorded and GSM system sends this data through SMS to the administration [2]. Anwaar Al-Lawati and Shaikha Al-Jahdhami proposed a paper where they present a system to supervise pick-up/drop-off of students to enhance their security during the day-to-day transportation to and from the school. The idea of this paper is, there are two principal units, a transport and school unit. [3]. Asif Ahmed, M Rayhan Parvez and Md Hridoy Hasan proposed a system which incorporates an Android application that can be utilized to send warnings during passage and exit of the students using radio frequency identification (RFID) just as Fingerprint scanner, guaranteeing appearance affirmation of the child by double verification. The system informs the guardians when the transport is 15 minutes away from their home. The main focus of this system is to show the possibility of a safe and smart school transport using global positioning system dependent on dual authentication systems [4]. Dhanasekar, N. Valavan, C. and, Soundarya worked on a paper where each RFID tag has information about each individual student which was read by a RFID reader and sent to their parents using GSM.This GSM modem can send the messages to authorized people as indicated by the received information [5].

Literatures show that RFID has been applied in different fields like supply, construction, library, heath, airline baggage tracking, electrical security keys. The utilization of RFID system can diminish operating costs and improve data storage and recovery. Currently, the administration has to record the students in and out times manually, the focus of this project is to to improve security of the children by keeping track of their locations and thus improve attendance management system. To solve the above-described limitations, with the aim to outline the system requirements, to investigate the impacts of RFID signals to environment and to justify whether RFID can be used for monitoring students.

There is an increased trend in wearable sensor technology and its use in educational institutions for administration and security purposes. This paper attempts to overcome the gaps faced in recent system while evolving the system to be appropriate for Indian schools.

III. Proposed System

System Architecture:

The proposed system is divided into two main units: transport unit located inside the school transport, and a school unit located inside the school campus. The school unit is the central unit where it collects data from all the buses, adds them to the system database, checks if there are missing children, and then send a text message notification to their parents.

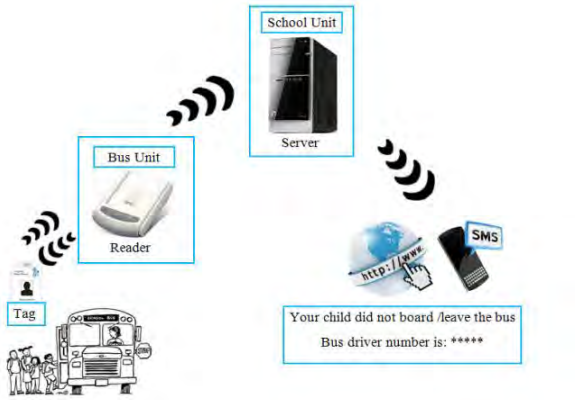


Fig1: The Proposed System Architecture

Our proposed system has the following advantages:

- The system utilizes RFID labels for kids' detection which is not harmful since it utilizes safe and legally approved frequency ranges.
- The deployment cost is sensible.
- The system is automated and easy to use.

RFID Technologies:

Radio Frequency Identification (RFID) is generic term for technologies that use radio-waves to automatically identify people or object [2]. The chip typically, is capable of carrying up to 2000 bytes of data. RFID provides a unique identifier for the object. As RFID technology is capable of automatically identifying each item by using radio waves, it replaces 'bar code ' technology because of its contact-less recognition, batch processing of data and reusability of information, contact-less recognition between RFID tag and reader

provides much flexibility and RFID technology gives longer recognition range [9].

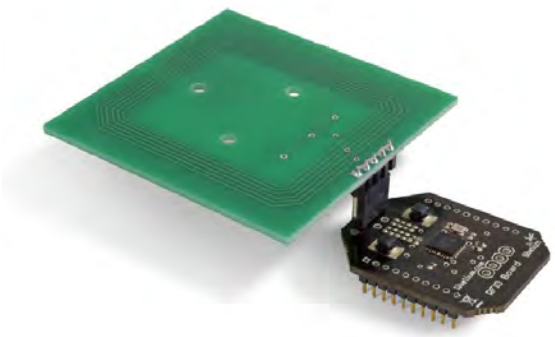


Fig2: RFID/NFC module for 13.56 MHz and antenna

RFID System:

An RFID system is composed of three mains components 1. An Antenna or coil, 2.A Transceiver (with decoder) and 3. An RFID Tag. The antenna will transmit radio signal to activate the tag so the data could be read or written. Data storage and retrieval purposes are performed using special devices, the RFID tag.

RFID Tag:

RFID tag is a component that can be attached to an item. It contains antennas to empower them to send and receive radio frequencies to and from handset. There are two types of RFID Tags: Passive and Active. Inactive labels require no inward force source, and are regularly utilized. Conversely, dynamic labels require a force source, and are more expensive.[3]. There is another kind of label which is called Semi-passive RFID which is like detached labels with the exception of the expansion of a little battery permitting them to have a modest quantity of consistent force.

RFID Reader:

RFID Reader is gadget that is utilized to query a RFID tag. The reader has an antenna that transmits radio waves, the tag reacts by sending back its information. Various variables can influence the distance at which a tag can be read.

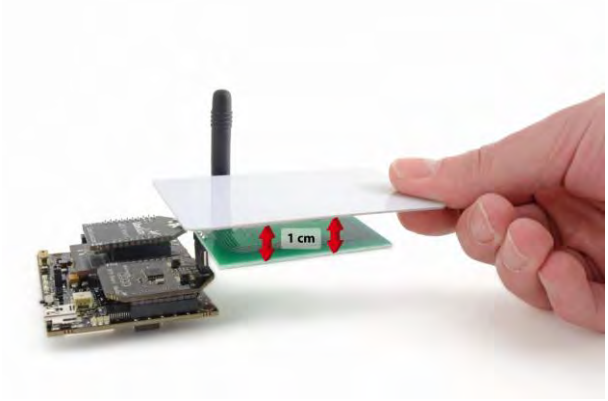


Fig3: Typical RFID/NFC operation

GSM:

GSM (Global System for Mobile communication) is a digital mobile telephony system. It works at either the 900 MHz or 1800 MHz frequency band.

The Transport Unit Description:

The transport unit will recognize the children when they board/leave the transport. It will utilize RFID technology to accomplish this task. This technology comprises of a reader and tags. There are three types of RFID readers depending on their frequency ranges, low, high and ultra-high frequency. We chose to use UHF RFID reader because it has a faster data transfer rate than the others. Also, the distance can be controlled to be short or long as required [6].

The RFID reader will be situated inside the school transport near the entrance, positioned such that it has a clear view and can recognize the children as they enter. Every kid will wear a card with RFID tag appended to it. The transport unit is responsible for sending relevant data to the school unit where it will be stored and processed further.

The School Unit Description:

The school unit comprises of a server interfaced with GSM modem to receive information from the transport. The server at the same time acts as a database and a web host to have the web-application created to control the system setting, update, and query the system database. Along with this, the server communicates with the SMS gateway to send warnings if a kid is identified missing.

System Database:

The database of the system has to meet certain business rules. A business rule is 'a brief and precise description of a policy within a specific organization'. It helps to determine entities, attributes and relationships of the database. The business rules followed by our system are:

- A child can be in only one bus, but a bus can have many children.
- A child has one or many relatives.
- A relative may have many children registered at the school.
- A bus may be driven by one or more drivers, but a driver can drive only one bus.
- A child may have many attendance records, but an attendance record has one child.

The Entity-Relationship (ER) diagram of the database is shown below:

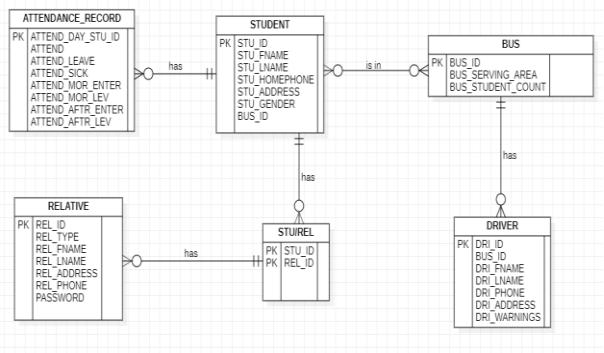


Fig4: ER diagram of database[2]

System Web-based Application:

One essential part in our system is the database-driven web- based application to manipulate the system, update, and query the database. There are two options to log into the website, as a parent or as an administrator. The administrator can add, modify, delete or view information about students and their relatives, buses and drivers. On the other hand, each parent can view the status of his/her child if they board/leave the bus.

IV. Simulation and Result

The overall infrastructure includes multiple key elements that can be classified into hardware and software. The hardware elements include the body tags, sensors, internet-enabled reader devices, database servers and WLAN networks. These combine with software – Simulation for hardware readers, web application, WhatsApp API for notifications, as well as database management tools.

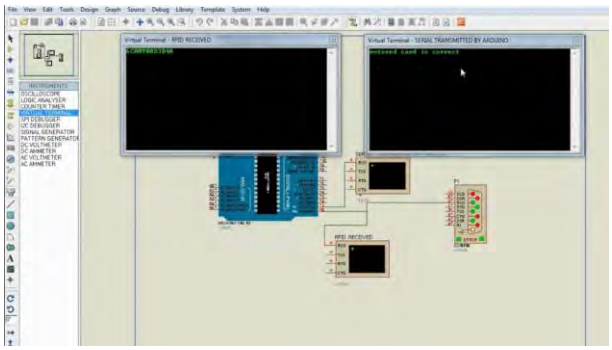


Fig5: Virtual Simulation of RFID

We virtually simulated the RFID tags using the Proteus Design Suite software to check whether the circuit was feasible and worked as per expectations.

The steps followed are as follows:

Step 1: Open Proteus and select the required components viz. Arduino Uno R3, COMPIM (used to connect the virtual serial port to Proteus simulator), Virtual terminals.

Step 2: Connect the pins of the components as shown in the above figure

Step 3: Open the Arduino software and write the required code.

Step 4: Compile the program and generate a hex file to be used in the Proteus Design Suite.

Step 5: Load the previously generated hex file in the Arduino Uno R3 module and start the Simulation.

After the simulation, to get the result we have to interface our RFID card which has its 12 bits unique code with RFID reader. In the first display box the 12 bits unique code of RFID card will be shown and on the second," entered card is correct" will be displayed if the RFID card has the right 12-bit code.

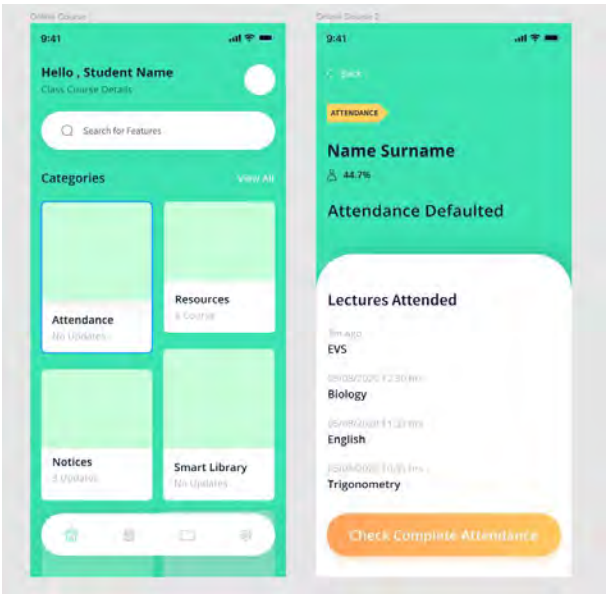


Fig6: UI for Web Application

After configuring hardware infrastructure, the next crucial component of the project is Web-Based application. This application enables all features of the project for the administration, guardians, teaching staff and students to show information, location, and other institute resources.

The modelling for this web-based UI is done on *Adobe XD UX* Integration modules that directly connect backend servers to the application and the encrypted data is accessed via user-login. Android Studio SDK tools are used to make the application compatible with mobile browser HTML5 Configuration. An integration service has been created using WhatsApp Business API, which enables automated WhatsApp notification for users based on *"subscription and sign up*" for updates. This API also enables auto-reply feature for Subscribed users over WhatsApp Application.

This successfully simulates the end project infrastructure that includes hardware simulation, processing of database servers, WLAN and GPRS Connections to various reading devices, and the front-end user application to enable the experience of this infrastructure for all stakeholders.

V. Conclusion

This paper introduced a RFID-based system that targets improving the wellbeing of kids during the everyday transport excursion to and from the school. It then sends, through a GSM modem, the important information to the system database server. The system checks and detects which child did not board or leave the bus and issues a warning. The system also checks the child's attendance and updates the database. The parents can log into system website and monitor the details of their wards. Future scope of the project is to build a robust data management system with encryption and real-time data-updation based on firebase technology.

REFERENCES

[1] C.Deenadayalan, M.Mural,L.R.Baanupriya ”Implementing Prototype Model for School Security System (SSS) Using RFID (2012)”, UG Student, Department of Electronics and Communication Engineering, I J.N.N Institute of Engineering College, Thiruvallur District, Chennai, Tamilnadu-6011 02, India.

[2] Anwaar Al-Lawati, Shaikha Al-Jahdhami, Asma Al-Belushi, Dalal Al-Adawi, Medhat Awadalla and Dawood Al-Abri, “RFID-based System for SchoolChildren Transportation Safety Enhancement (2015)”, Department of Electrical and Computer Engineering, Sultan Qaboos University PO Box: 33, Al-Khod 123, Oman.

[3] Dr. R. Kamalraj, Dr. E.S. Madhan, Ms. K. Ghamya, Ms. V. Bhargavi, “Enhance Safety and Security System for Children in School Campus by using Wearable Sensors (2020)”. Department of Computer Science and Engineering, Sree Vidyanikethan Engineering College, Tirupati, India

[4] Akpınar, S., & Kaptan, H. (2010). Computer aided school administration system using RFID technology. Procedia-Social and Behavioral Sciences, 2(2), 4392-4397.

[5] Raad, M. W., Deriche, M., & Sheltami, T. (2020). An IoT-Based School Bus and Vehicle Tracking System Using RFID Technology and Mobile Data Networks. Arabian Journal for Science and Engineering, 1-11.

[6] Deenadayalan, C., Murali, M., & Baanupriya, L. R. (2012, July). Implementing prtotype model for School Security System (SSS) using RFID. In 2012 Third International Conference on Computing, Communication and Networking Technologies (ICCCNT'12) (pp. 1-6). IEEE.

[7] Raad, M. W., Deriche, M., & Sheltami, T. (2020). An IoT-Based School Bus and Vehicle Tracking System Using RFID Technology and Mobile Data Networks. Arabian Journal for Science and Engineering, 1-11.

[9] Kumari, M., Kumar, A., & Khan, A. (2020, February). IoT Based Intelligent Real-Time System for Bus Tracking and Monitoring. In 2020 International Conference on Power Electronics & IoT Applications in Renewable Energy and its Control (PARC) (pp. 226-230). IEEE.

This page is kept blank intentionally

People Detection and Tracking using Improved Temporal Frame Differencing and CSRT Tracking

Dr.K.Ramar
Professor & Dean R&D,
Muthayammal Engineering College
(Autonomous), Rasipuram,
Mumbai, India
dean.cse@mec.edu.in

M.Gomathy Nayagam
Assistant Professor(SG)/CSE,
Ramco Institute of Technology,
Rajapalayam,
m.g.nayagam@gmail.com

M. Buvaneswari
3Assistant Professor/CSE,
Muthayammal Engineering College
(Autonomous),
buvaneswari.m.cse@mec.edu.in

***Abstract*— People Detection in video surveillance is critical for various application areas include abnormal event detection, human giant characterization, person identification, gender recognition and etc. In this paper, a novel fast multiple people detection and tracking method is proposed. The temporal frame differencing is one of the simple, very easy to implement method for object detection and which is very adaptive to dynamic scene change in video. But, it generally fails in detecting some type of objects. Hence, this algorithm integrates temporal frame differencing, HoG, linear SVM for detecting an object accurately and use Channel and Spatial Reliability Tracker (CSRT) for accurately track the objects in all the frames. Experimental results show that the proposed method is robust when compared to other technique.**

I. INTRODUCTION

In the recent years, video surveillance system becomes most popular for the purpose of security in private and public domain. Most of the researchers try to develop intelligent video surveillance systems to replace the traditional passive video surveillance system [1,2,3]. An intelligent people detection system detect the people at initial stage and subsequently process for various application such as people classification, people tracking and people behaviour analysis. But the successful automatic people detection and tracking is more challenging task due to many reasons viz. different type of clothing, fake detection [4] (i.e. Non-people detection), body shape and etc. There are three typical methods for moving object (people) detection [3]: background subtraction, temporal frame differencing and optical flow. Background subtraction is susceptible to dynamic changes due to lighting and extraneous events. Temporal frame differencing is suitable for dynamic environment; but it often extracts incomplete relevant moving object pixel. Hence in this paper, we integrate temporal frame differencing approach with HOG feature descriptor to improve the detection and classify the people for tracking by using CSR tracker. The remaining of the paper is organized as follows: Section 2 presents the proposed approach. The methodology used in the proposed approach is discussed in section 3. Section 4 describes the performance analysis of the proposed system. The conclusion of this work is presented in section 4.

II. PROPOSED ALGORITHM

We have proposed a people detection and tracking using temporal frame differencing integrates with HOG descriptor, SVM classifier and uses channel and spatial reliability tracker (CSRT) for tracking detected object. The system overview of the proposed work is shown in the Figure 1.

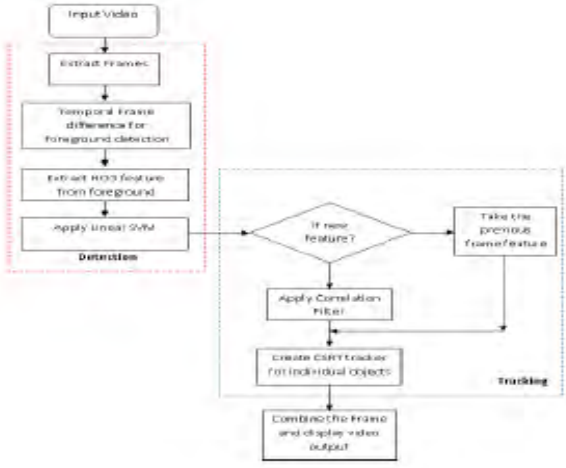


Figure. 1 Proposed System Overview

In this proposed algorithm, we studied tracking-by-detection. First step of this proposed algorithm is to extract the frames from input video, apply temporal frame differencing to separate the foreground mask from the video frame. Then, use the HOG descriptor to extract the feature of foreground mask which is tracked by using correlation filters with CSRT tracker. It will predict the position of the moving objects.

III. METHODOLOGY

In this section, the methodology of our detection and tracking method is described.

3.1. Detection:

3.1.1.Temporal Frame Differencing:

The detection of object in frame by using temporal frame differencing technique which is based on difference between two consecutive frames in a video

sequence. It is highly adaptive to static environment. Let I_k , I_k+1 are the value of kth and $(k+1)^{th}$ frame in video sequence. The temporal frame difference between the frame is defined as:

$I_{d\,(k,k+1)}=|I_{k+1}- I_k|$, for k=1,2,... n=number of frames… (1)

Due to holes in the moving object area, contour of the moving object is not closed. Hence the absolute difference image is transformed to gray image by the following formula:

RGB to Gray:

Y <- 0.299*R+0.587*G+0.114*B ……. (2)

The sample temporal frame difference based video frames are:

3.1.2. HOG Feature extraction:

The HOG feature is extracted from the moving blobs generated by temporal frame differencing technique. The HOG feature extraction process consists of the following steps:

Normalize Gamma/Colour:

It is one of the pre-processing steps for HOG feature extractions which can be omitted because of obtained result by succeeding descriptor normalization are similar. With power law (gamma) equalization D. Dalal and B.Triggs evaluated some gray scale RGB and LAB colour space in their experiments [6].

Gradient Computation:

Several masks are used for gradient computation viz un centred [-1,1], centred [-1,0,1], cubic –corrected [1,-8,0,8,1], the 3 x 3 sobel or 2x 2 diagonal mask. Simple 1D centred mask will produce best result [6] which requires filtering the gradient of gray-scale image with [-1,0,1] and $[-1,0,1]^T$ kernels for computing gradients of image in both horizontal and vertical directions. Mathematical model for computing gradient is shown below.

Horizontal Gradient: $I_x=I(x+1,y) – I(x-1,y)$ …….. (3)

Vertical Gradient: $I_y=I(x,y+1) – I(x,y-1)$ …….. (4)

Magnitude: $m= \sqrt{I_x^2+I_y^2}$ …… (5)

Direction: $\Theta = \arctan Iy/Ix$ ……..…… (6)

Spatial/ Orientation Binding:

Each pixel spreads a weighted vote for an edge orientation histogram channel with in cells which is based on elements obtained in the gradient measurement. The shape of the cell may be either rectangular or radial. The orientation bins are equally spaced over 0o – 180o when the gradient is unsigned whereas which are spaced over 0o – 360o when gradient is signed.

Detection Window and Context:

The descriptor size should be decided after extracting the feature. The 64x128 descriptor size, containing around 16 pixels which improves the performance.

Support Vector Machine(SVM):

After extracting feature, SVM is applied to determine if the feature belongs to human or not. Generally, linear SVM trained with SVM Light is used for detecting human. SVM is a machine learning technique which is used to analyze data for classification and regression analysis. The mathematical model for SVM is:

$$f(x)= W^Tx+b \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (7)$$

3.2. Tracking:

3.2.1. CSRT Tracking:

Once system found the human RoI in video, which has to be track by using Discriminative Correlation Filter with Channel and Spatial reliability tracker (CSRT). It uses two features HOG and Color names. This tracker uses spatial reliability map for adjusting the filter support to the part of the selected ROI from the frame for tracking. Also, it ensures enlarging and localization of the selected ROI and improved tracking of non-rectangular region or object.

3.2.3. Algorithm Pseudo Code

With each image frame f in video v:

$I_{d(k,k+1)}=|I_{k+1}- I_k|$, for k=1,2,... n=number of frames

Extract the HOG feature of foreground by

$I_x=I(x+1,y) – I(x-1,y)$

$I_y=I(x,y+1) – I(x,y-1)$

$m= \sqrt{I_x^2+I_y^2}$

$\Theta = \arctan Iy/Ix$

Apply SVM

$f(x)= W^Tx+b$

Check any new feature is identified ?

If yes then,

Apply Correlation filter

Else:

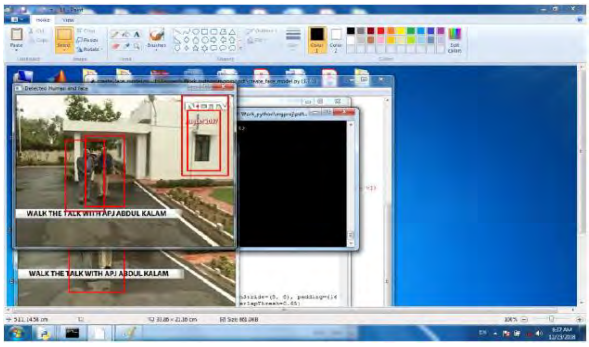
Use the previous frame feature and track the objects feature in current frame

Create tracker for each individual object

End:

IV. Results and Discussion

The following figure shows the people detection and tracking of each frames in videos and the corresponding frame processing time



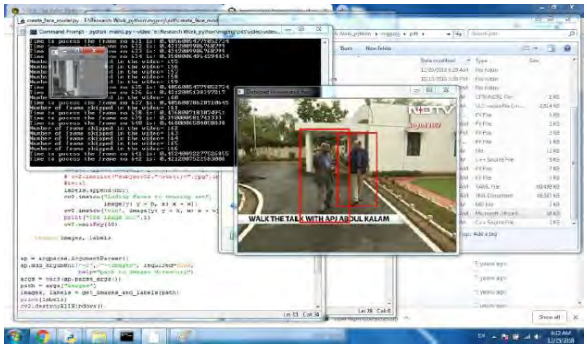
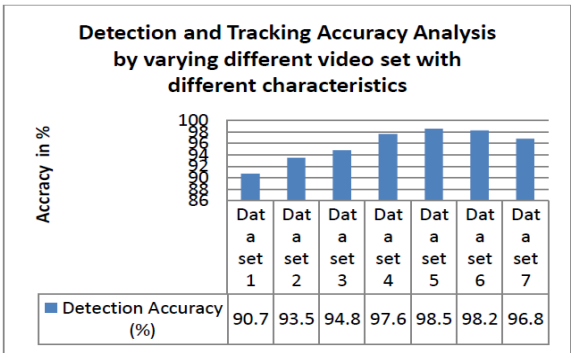


Figure.2. People Detection and Tracking with processing Time of Each frame



V. CONCLUSION

The main aim of this work is to detect and track the people using Improved Temporal Frame Differencing and CSRT Tracking. This algorithm integrated temporal frame differencing, HoG, linear SVM for detected an object accurately and used channel and spatial reliability tracker (CSRT) for accurately track the objects in all the frames. Experimental results show that the proposed method is robust when compared to other technique. The proposed were tested in various set of dataset with varying nature of videos.

REFERENCES

1. W. M. Hu, T –N.Tan, L.Wang and S.Maybank, 'A Survey on Visual Surveillance of object motion and behaviours', IEEE Trans. on System ,Man and Cybernetics – Part C: Application and Reviews, Vo. 34,no.3,pp.334-352,2004.

2. N.Jacobs and R.Pless, 'Time Scales in video surevillance', IEEE Trans. on Circuits and System for video Technology,vol.18,no.8,pp.1106-1113,2008.

3 M.Gomathy Nayagam and Dr.K.Ramar,'A survey on Realtime Object Detection and Tracking Algorithms', International Journal of Applied Engineering Research, Vol.10, no.9,pp.8290-8297,2015.

4. F-H. Cheng, and Y.-L. Chen,' Real time Multiple object tracking and identificationbased on discrete wavelet transform', Pattern Recogntion, vol.39,no.3,pp.1126-1139,2006.

5 K.-Q.Haung, L.-S.Wang,T.-I.Tan and S.Maybank,'A real time object detection and tracking system for outdoor night surveillance',Pattern Recognition, vol.41.,no.1,pp.423-444,2008.

6. N. Dalal and B. Triggs, "Histograms of oriented gradients for human detection". In CVPR, 2005.

7. M.Gomathy Nayagam and Dr.K.Ramar, 'A Reliable Object Recognition system for Cloud video data based on LDP features', Elsevier Journal of Computer Communications, (149), 343-349.

8. Alan ., et.al., 'Discriminative Correlation Filter with Channel and Spatial Reliability', CVPR, IEEE Explorer, 6309-6318, 2018.

9. G. Zhu, F. Porikli, and H. Li. Beyond local search: Tracking objects everywhere with instance-specific proposals. In The IEEE Conference on Computer Vision and Pattern Recognition (CVPR), pages 943–951, June 2016.

This page is kept blank intentionally

An Intelligent System for Monitoring Gases and Smoke Concentration Using Zigbee Technology

Shrey Jain
Department of Electronics And Telecommunications Thakur College of Engineering and Technology Mumbai, India
shreyjain601@gmail.com

Axit Mehta
Department of Electronics And Telecommunications Thakur College of Engineering and Technology Mumbai, India
axitmehta9@gmail.com

Niraj Mishra
Department of Electronics And Telecommunications Thakur College of Engineering and Technology Mumbai, India
nirajss2702@gmail.com

Mrs. Rashmita Kumari Mohapatra
Department of Electronics And Telecommunications Thakur College of Engineering and Technology Mumbai, India
rashmita.mohapatra@thakureducation.org

***Abstract* – Fire caused because of different gases is quite possibly the most widely recognized reasons for property harm costing up to billions and the passing of 1,000 lives on the planet consistently, which is regularly brought about by carelessness and sheer lack of concern of its consequences.In this work, the framework is been founded on the idea of Web of Things, where it uses the well known Zigbee innovation, which goes along under the 802.15.4 Low Force Remote Lattice Standard for signal transmission in an alarm framework. Our coordinated equipment programming framework utilizes some AI standards and least square relapse rule to distinguish from the start another gas test, or a blend, and afterward to assess the focuses. Specifically we receive a preparation model utilizing the Help Vector Machine (SVM) approach with direct piece to instruct the framework how segregate among various gases.**

Keywords- Zigbee technology, Support vector machine, Gases, least square regression, Internet of things, Fire, Signal transmission.

I. INTODUCTION

The wide deployment of sensing technologies in our daily living environments and the pervasive usage of mobile devices bring about great opportunities for the deployment of smoke alarms [1]. At present, most of the traditional smoke alarm systems consist of sensor modules, transmission lines, and monitors, each of which is connected to a sensor module [2]. Therefore, there is a defect in the accuracy and timeliness of the traditional alarm system. The misinformation of the fire alarm caused by water mist or oil smoke causes unnecessary losses to the people. People spend a long time in vehicles on roads after homes and offices [3, 4]; they want to get the right fire alarm while they are in the distance. And there are two main reasons for these problems.

(1) The Way to Judge Whether or Not Fire Is Too Simple. The traditional smoke alarm system only detects a single environmental value. If the detection value exceeds the threshold, it is judged to be a fire. There are many uncertainties in the fire scene that will cause the smoke alarm system to be unable to accurately determine the fire, such as temperature, combustible gas concentration, smoke particle concentration, and barometric pressure, which can lead to false positives, omission, delay reporting, and other phenomena which occur frequently

When designing the communication system, we want it to be able to support multipoint data transmission with low complexity, low cost, and high reliability. So, we choose to use ZigBee. In addition, we designed and implemented data visualization on the web to ensure that the users can monitor their homes remotely.

II. LITERATURE SURVEY

Global System for Mobile Communication (GSM) Based Wireless sensor Network

A GSM-based communication system for a wireless sensor network was developed by Hossain, Haque and Bhattacharyya entitled “GSM based Wireless Sensor Network to Measure Global Warming, Humidity and CO_2”. The study aims to measure the increase of global warming and air pollution. Each sensor node is connected with the receiver through a GSM network. The network is considered the only means of a WSN to measure global warming, humidity and carbon dioxide over a huge area. Each node consists of sensors (temperature, humidity and carbon dioxide), real time clock (RTC) module, 2 GB SD card, GSM module and Atmega8 microcontroller. The RTC gets the exact time stamp of each measurement, while sensor values are stored in the SD card. Data is logged and collected to the SD card on low power levels whenever the node does not have enough power to transmit a signal. The GSM module attached to the Arduino microcontroller enables the node to send data gathered by the nodes to the receiver. The receiver is interfaced to a PC then displays all the data sent by the nodes.

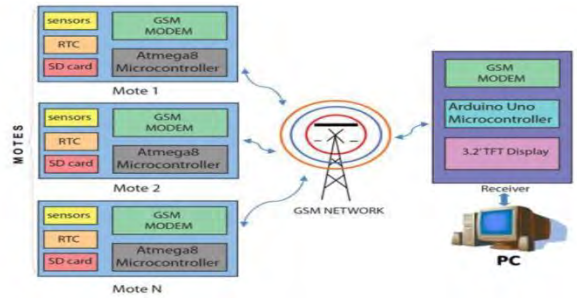


Figure 1. GSM based WSN environment monitoring system

The investigation infers that GSM has extremely significant distance information transmission ability, offering the best reach choice versus other remote advancements and essentially limitless hub check. The framework is considered as a dependable, simple and modest answer for a framework which requires modest quantities of information move. In any case, its usage on a medium to enormous scope would require high upkeep costs because of paid information transmission combining SIM (supporter modules) cards.Ideally, the framework is completely worthwhile when administration charges are ignored for a specific reason. Potential shortcomings of the framework are network traffic or sign debasement during stormy climate. The framework is considered for home applications wherein longrange correspondence, low hub check, and low information prerequisite are considered key contemplations for certain clients.

The study concludes that it can be used as a solution to overcome the traditional and manual methods of data collection, together with the use of technologies with short range transmission. The system used Wi-Fi as a wireless technology to continuously transmit data in wide range with low cost. However, the inclusion of a battery component in the sensor node was not illustrated to describe standard battery performance for Wi-Fi-based wireless sensor networks.

Data acquisition nodes, data sink nodes and the fire control center. The data acquisition nodes are composed of an embedded wireless sensor module which is an integration of sensors, a single microcontroller, and an RF transceiver. After the sensors preprocess the detected fire signals, the node automatically chooses an optimal path to send them to the network sink. The data sink node forwards the data from the sensor network nodes to the fire control center, which may be sent through an external network such as internet when necessary.

According to the conclusions of the study, the wireless automatic fire alarm system based on Zigbee technology overcomes the limitations of the cabled alarm system while avoiding high power consumption of other wireless technologies. Zigbee is a wireless mesh technology, and compared to other existing wireless technologies, it offers some advantages such as low cost, high network capacity and long life of sensor nodes. Mesh networks use short-range, high data rate wireless devices to build networks that depend on relaying the data between nodes (Link Labs, 2016). Zigbee follows the standards of IEEE 802.15.4, wherein it was created to address the complexities and expensiveness of Bluetooth technology (IEEE 802.15.1) in wireless sensor networks. Its mesh network capability allows a better coverage for the nodes through relaying of data, compared to other mentioned wireless technologies.

III. MOTIVATION

The significance of alarm framework can be seen and noted as a mandatory necessity forstructures in any country, close by with the act of other fire security measures and plan procedures. Also, alarm frameworks or gadgets will be given in each building or design of such size, plan, or inhabitance, to give sufficient notice to tenants.

IV. SCOPE OF THE PROJECT

The temperature sensor shall operate on a fixed-temperature basis, wherein an alarm will be automatically triggered after ambient temperature levels have exceeded the fixed threshold. These are the most commonly used types of heat detectors. The ‘fire warning’s threshold will be set at 37.8°C (low temperature rating), while the ‘fire alarm’ threshold will be at 57.2°C.The smoke sensor with its own IC-controlled circuit will automatically trigger an alarm output after the presence of smoke has been recognized by its detection chambers. Its sensitivity level will be set to default in accordance to the ionization smoke detector IC data sheet specification and the existing circuit schematic available.

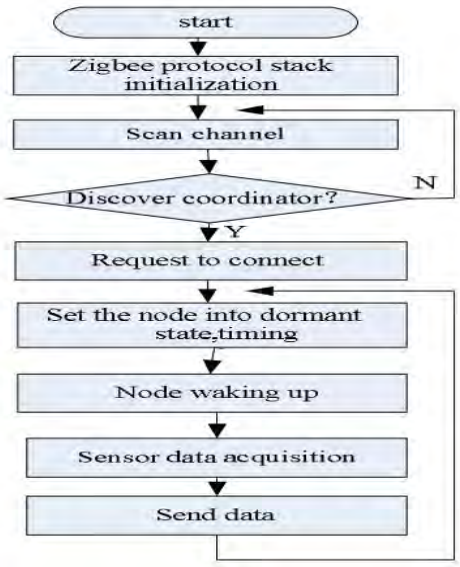


Figure 2.Hardware working Chart of Detection Node

The system, despite being considered in a way as ‘wireless’, still requires the nodes to be powered through the supply mains. The batteries only act as the

backup source of power during power interruption events.The node rechargeable backup batteries shall have at least 1000 mAh battery capacity, not lower compared to the charging current of the Li-ion charging module (1 ampere), also enough to power the nodes for a minimum of 2-3 hours until power is restored

V. METHODOLOGY

ZigBee Wireless detection node is composed of the data acquisition unit, data processing unit, data transmission unit and battery-powered unit. Data acquisition unit is primarily through sensors to detect gas concentration, temperature and smoke concentration of the region. Data processing unit controls the node to process the detection data. Data transmission unit completes the interaction with the router and 2010 International Conference on Cyber-Enabled Distributed Computing and Knowledge Discovery coordinator. Power supply unit is responsible for the energy of the node.

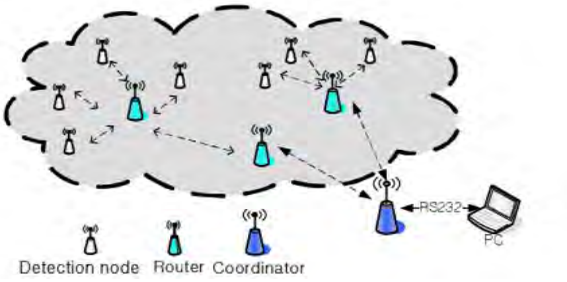


Figure 3. Pictorial Representation of Zigbee Network

The architecture is primarily formed by the PHY (physical) layer, MAC (media access control) layer, NWK (network) layer and APL (application) layer. The PHY layer and the MAC layer adopt IEEE802.15.4 protocol.

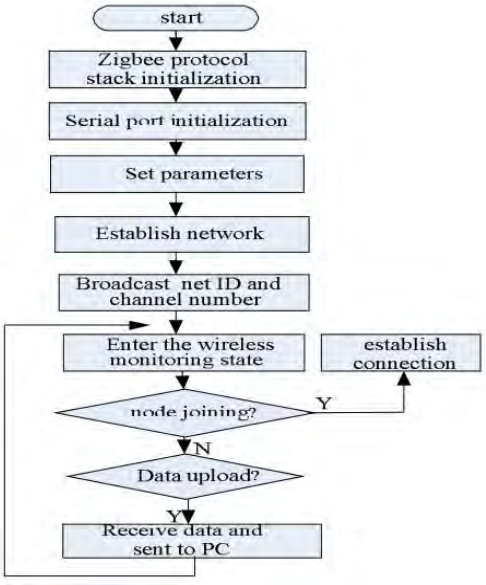


Figure 4. Software Flow Chart of Coordinator Node

In this system, we use CC2430 as the core of the wireless transceiver and processing module. The CC2430, a SOC (system on a chip) loading the ZigBee technique, is a kind of ZigBee wireless single chip microcomputer. CC2430 has a transceiver core, a high-performance 8051 controller, 128KB Flash , 8KB RAM, ADC, 16-bit timer and two 8-bit timer, AES128 synergistic processing device, watchdog timer, the sleep mode timer of 32 kHz crystal oscillator , power-on reset circuit, power failure detection circuit, and 21 programmable I / O pins[3]. Its peripheral circuits include crystal oscillator clock circuit, RF input/output matching circuit and micro-controller interface circuit. High-gain vertical antenna with proprietary 2.4G SMA interface is used in the module.

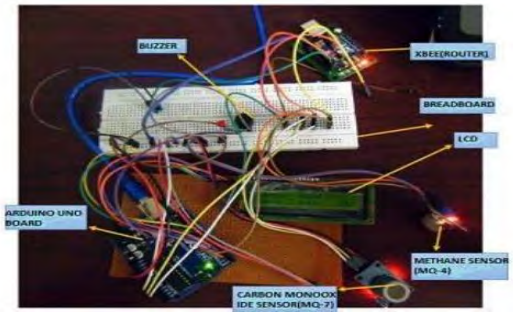


Figure 5. Block Diagram of System

VI.RESULT AND DISCUSSION

To test the designed real time monitoring system using wireless sensor network, an artificialenvironment is simulated. As a first implementation, we designed the complete system on a breadboard which is presented. As it is clearly being observedthat when the sensors will sense the detected gas, the information will be transmitted to the Zigbee module which is then interface by arduino board and then it will be display by LCD unit. If the at the point when concentration level of gas is not in the middle of permissible limit is identified, LCD will gives cautioning alert and alarm generates and thus through XBEE our software part will detect and further preventives measures is taken.

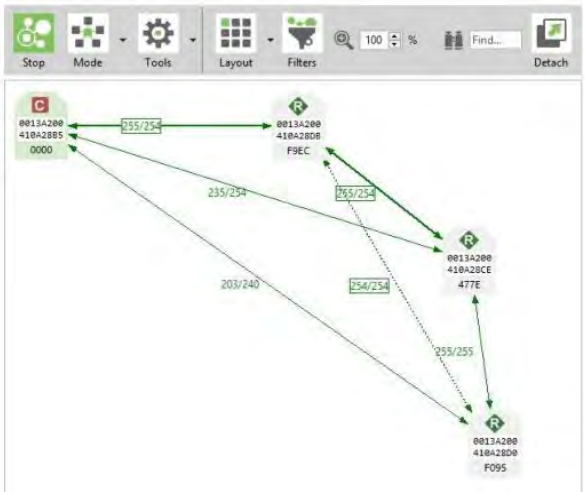


Figure 6. Software output

Auto-Mesh Configuration of Different XBee Modules in the Same Network. The reason behind the auto-mesh configuration is that the XBee devices employs an Ad-hoc on demand distance vector (AODV) mesh routing. This feature allows packets of data to hop from the source to the endpoint.

VII. EXPECTED OUTCOME

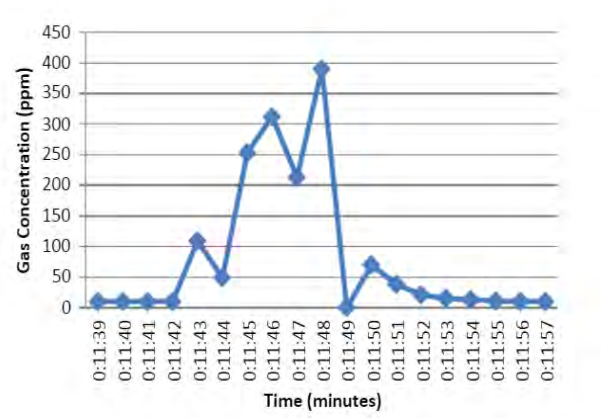


Figure 7. Graph of Gas Leakage Detection [7]

The above graph shows the leakage of gas concentration reaches the threshold value of dangerous condition, which exceed 512ppm therefore the system will send alarm signal to alert the users.

Thus in future outcomes, the data set for these gases will be made up of samples in R^8 with each sample corresponding to the outputs of the sensors for a given couple (gas, concentration). In the first analysis, we will be using a SVM with a linear kernel function, and thus can apply a multiclass classification by using the LIBSVM-2.82 package.

VIII.CONCLUSION

The Zigbee-Based Fire Caution Framework is created to use the cutting-edge idea of Web of Things (IoT) and remote sensor networks in remote security frameworks, for example, alarms, which presents a further developed, helpful and successful route in giving assurance to foundations and their inhabitants. All crisis, inconvenience, status and administrative signs are dependably and effectively communicated by every hub towards the checking focus board, which thusly shows to the client these signs progressively with low deferrals and precision.

Also, the framework uses components and highlights considered fundamental and fundamental in an alarm framework to be instinctive and dependable, for example, gadget surveying, status and inconvenience location, far off and manual gadget activity control and caution initiation. All in all, the general and explicit destinations of the investigation were agreeably met alongside the prerequisites which are demonstrated by the test outcomes.

REFERENCES

[1] Liu Shixing, Tu Defeng, Zhang Yongming. “Multiparameter Fire Detection Based on Wireless Sensor Network”. Proceedings 2009 IEEE International Conference on ICIS2009.11.Vol.3, P203-206.

[2] Yunzhou ZHANG, Dingyu XUE, Chengdong WU, Hao CHU. “Design and Implementation of A Wireless Sensor Network Node”.Proceedings of 2008 IEEE International Conference on WiCOM. pp:14.doi:1109/WiCom.2008.906.

[3] WANG Qingzhu, LIU Rongchang, MA Yuquan, ZHAO Jinchuan, FENG Lizhen, LIU Shiguang. “Application Study of Mine Alarm System Based on ZigBee Technology”Proceedings of ICAL2008. P2537 – 2540.

[4] Texas Instrument http：//focus.ti.corn/lit/ds/symlink/tmp102 .pdf

Smart Indoor Air Quality Monitoring

Vivek Singh
E&TC dept.
Thakur College Engineering and Technology
Mumbai,India
vivek99sanjeetsingh@gmail.com

Sparsh Raikar
E&TC dept.
Thakur College Engineering and Technology
Mumbai,India
raikarsparsh@gmail.com

Sagar Pandey
E&TC dept.
Thakur College Engineering and Technology
Mumbai,India
pandey6799@gmail.com

Dr. Sangeeta Mishra
E&TC dept.
Thakur College Engineering and Technology
Mumbai,India

***Abstract*— IOT-based method to monitor the Air Quality of a region. The technology comprises of three parts namely, the Air Quality Monitoring Sensor, the Temperature and Humidity Sensor and the Cloud-based Monitoring module. Firstly, the environmental data is gathered by the deployed air quality (CO_2), and the temperature and humidity sensors, this data is sent to the Raspberry Pi module for processing and then sent to the Cloud-based monitoring module. The Raspberry Pi sends a notification to the user in case the CO_2 level exceeds the safety limit. The Cloud-based monitoring module is responsible for receiving and storing the data, and finally presenting the acquired information to the user through different channels, such as Web portal.**

Keywords*— *Air Quality, Gas sensors, IOT, Cloud, MQ-135, DHT11, Monitoring, Raspberry Pi, Visualization

I. INTRODUCTION

Over the past quarter century, there has been an exponential growth of industries. These industries have caused complex and serious problems to the environment, the menace of air and sound pollution have started to impact human lives [5]. Recent studies have shown substantial evidences that exposure to atmospheric pollutants has strong links to adverse diseases including asthma and lung inflammation. In terms of economic impact, the association between air pollution and human health inevitably results in increase of healthcare services costs in terms of hospital admissions and emergency room visits. Considering the significance of air quality on human lives, the World Health Organization (WHO) has developed guidelines for reducing the health effects of air pollution on public health by setting the limits of the concentrations of various air pollutants, some of which are ground–level ozone (O3), nitrogen dioxide (NO2), and sulfur dioxide (SO2) [1]. Traditionally, the concentrations of air pollutants are measured using air quality monitoring (AQM) stations that are highly reliable, Precise, accurate, and are able to measure a wide spectrum of pollutants using standardized analyzers. However, these stations have some drawbacks like they are bulky, very Complex, and expensive and needs regular maintenance and calibration. These drawbacks reduce the number of installations and result in sparsely distributed AQM networks with limited spatial resolution air pollution data. This work proposes a method combining IOT technology with environment monitoring. To overcome these problems researchers developed new techniques which comprises of deployment of inexpensive array of gaseous sensors. Recent development of electronics has realized the vision of using wireless communication in devices used for monitoring wide range of real-life parameters, such as temperature, pressure, and air pollution [1]. These devices send their measurements wirelessly to a database hosted on a remote server for further processing and analysis. We propose a model which would provide the user an inexpensive and localized air pollution monitoring.

II. LITERATURE SURVEY

Due to the drawbacks of the conventional air quality monitoring stations, scientists and researchers have moved to the next generation air quality monitoring technology in which small sized and inexpensive AQM motes that incorporates an array of gaseous sensors can be deployed to give air pollution data at a micro scale. This data can then be sent wirelessly to an intelligent server which can process this data and predict the levels of pollutants in a particular area.

Mohan Lalit et al. proposed a model to remotely monitor various environmental parameters like noise, CO and radiation levels in a particular area of interest by using sensors is proposed, uploading this information to cloud and presenting the latest estimated trends to the user after visualization. This system also notifies if any parameter crosses the threshold value so that appropriate actions could be undertaken by the controller .[2]

Arnab Kumar Saha et al. proposed a system that uses a Raspberry Pi 3B microcontroller, which will have gas sensors and noise sensors connected to it, to monitor the fluctuating environmental parameters. [3]

G. Parmar et al. have proposed a low-cost air pollution monitoring system using semiconductor gas sensors to measure the target gas concentrations, the gas sensors used here are MQ 135 and MQ 7. This project uses Nucleo F401REtx which is a 32 bit microcontroller which has sensors attached to it, its job is to collect and transmit data to the central controller which in this case is Raspberry Pi. [5]

Anjaiah Guthi et al. have proposed a model evaluated using prototype implementation, consisting of Arduino UNO board, sensor devices and MATLAB with Arduino hardware support package. This model is adaptable and distributive for any infrastructural

environment that needs continuous monitoring, controlling and behavior analysis. [8]

III. Gap Analysis

The above papers propose a system to monitor air pollution and display it to the end user but for the user to initiate any kind of action they need to be notified if the level of pollution in their area is crossing the safe limit. Notifying the user when the pollutants cross the safety limit allows the user to take the necessary action in a timely manner.
The previous work in this area does not give emphasis on cloud computing, with the help of cloud computing the user can access the data anywhere in the world.

IV. Methodology

In the proposed system shown in fig 1 two sensors namely MQ135 gas sensor and DHT 11 Temperature and Humidity sensor have been used. MQ135 sensor module is used which comes with an op amp comparator and a digital output pin. All these sensors are connected to the Arduino UNO board which reads the data. The Arduino is interfaced with the Raspberry Pi so the data collected by the Arduino is sent to the Raspberry Pi.

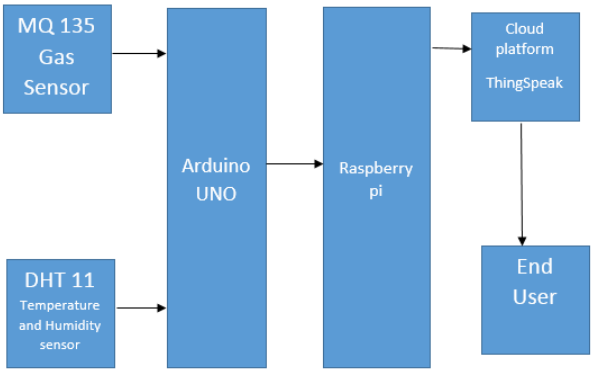


Fig 1: Block Diagram

The Raspberry Pi 3B has an inbuilt Wi-Fi module that can upload the data to the cloud. ThingSpeak has been used for this project. ThingSpeak is an open IOT platform, it provides instant visualizations of data posted by the sensor device to thingspeak. It also supports Matlab analysis.
The user can access the thingspeak from anywhere in the world.
To send the data to thingSpeak it generates a unique API key.

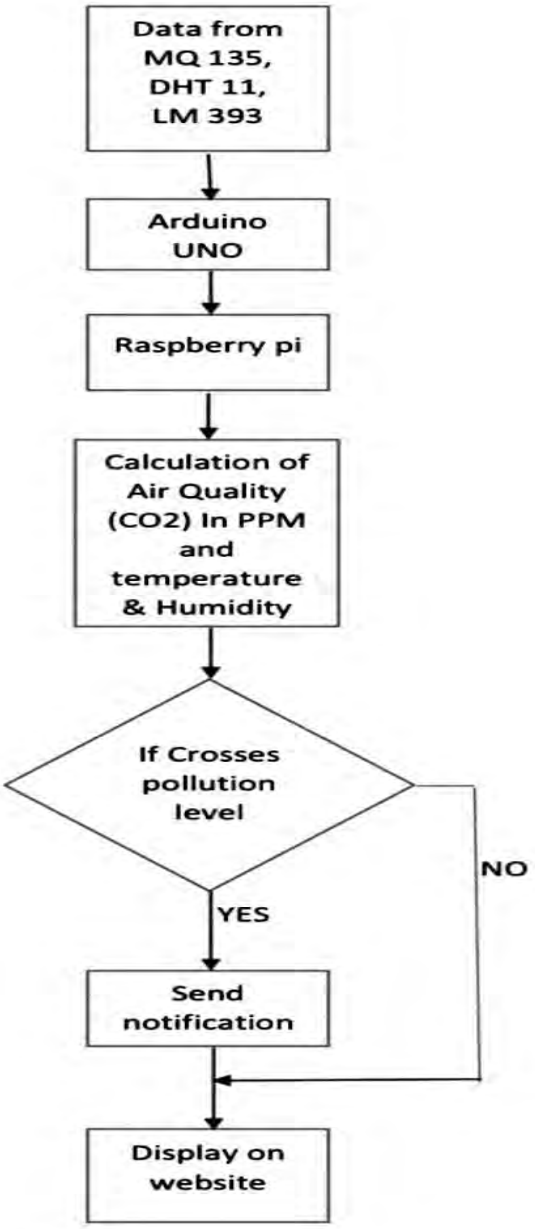


Fig 2: Data Flow Diagram

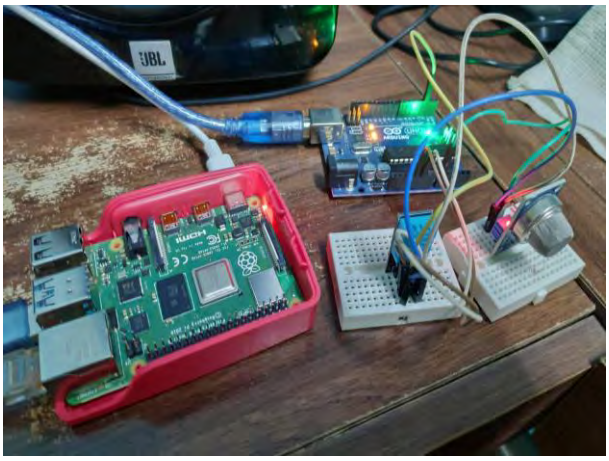


Fig 3: Hardware Setup

In Fig. 3 the environmental parameters are recorded by the sensors and sent to the Arduino.

CO_2 [ppm]	Air Quality
2100	BAD Heavily contaminated indoor air Ventilation required
2000	
1900	
1800	
1700	
1600	
1500	MEDIOCRE Contaminated indoor air Ventilation recommended
1400	
1300	
1200	
1100	
1000	FAIR
900	
800	GOOD
700	
600	EXCELLENT
500	
400	

Fig 4: CO_2 Alert Levels

V. RESULTS

A) DHT 11 Sensor

1) *Temperature Readings*

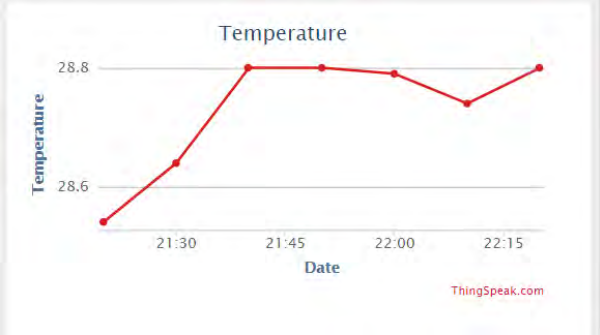


Fig. 5: Temperature Readings

In Fig.5 the temperature readings from the DHT 11 sensor averaged over a period of 10 min are displayed on ThingSpeak.

2) *Humidity Readings*

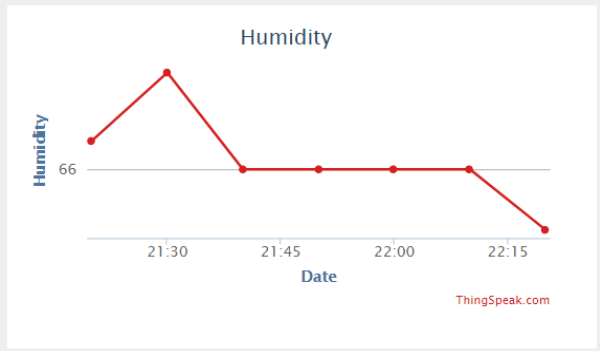


Fig. 6: Humidity Readings

In Fig. 6 the humidity readings from the DHT 11 sensor averaged over a period of 10 min are displayed on ThingSpeak.

B) MQ-135 Sensor

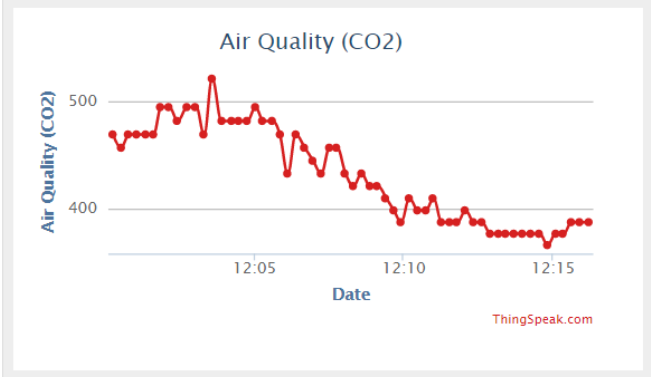


Fig. 7: CO_2 concentration (ppm)

In Fig. 7 CO_2 concentration levels from the sensor are displayed on ThingSpeak every 15 seconds.

C) Email Notification

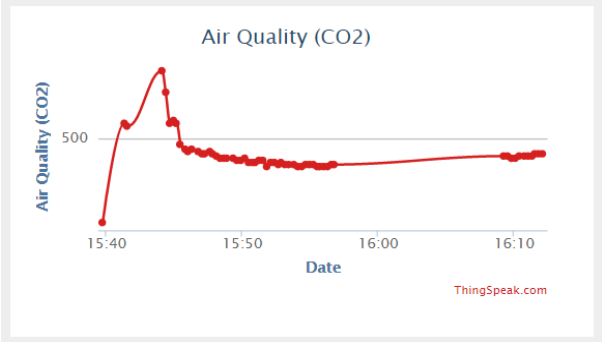


Fig 8: High CO_2 Level Recorded (crossed 1000)

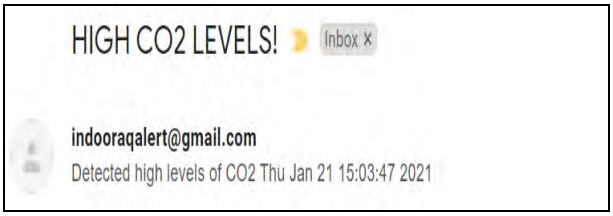


Fig 9: Email sent to user

An email is sent to the user when the carbon dioxide level exceeds the safety limit.

VI. CONCLUSION

The model describes a smart way to monitor the various environmental parameters using a Raspberry Pi and Arduino. The concept of IoT helps improve the quality of air, and monitor temperature and humidity. It is a

low-cost, precise and efficient method of monitoring. The monitoring of accumulated data in the cloud storage helps to analyze the various patterns in the environment and notify the user about changes in those patterns to take the necessary prevention steps.

VII. FUTURE SCOPE

In this paper an application of internet of things (IOT) has been proposed, Raspberry Pi is used to send the acquired data over the cloud. Commercial cloud platforms allow us to store a lot of data without worrying about scaling or maintaining the servers, this data can be used to train a machine learning model which will have the ability to predict the future pollution levels.

To improve the sensing capacity of the system more sensors can be added to measure different gasses.

REFERENCES

.

[1] K. Bashir Shaban, A. Kadri and E. Rezk, "Urban Air Pollution Monitoring System With Forecasting Models" in IEEE Sensors Journal, vol. 16, no. 8, pp. 2598-2606, April15, 2016, doi: 10.1109/JSEN.2016.2514378.

[2] Mohan Lalit, "Research paper on IOT based Air and Sound Pollution Monitoring System." International Journal of Computer Applications. 178. 36-49. 10.5120/ijca2017915840.

[3] Arnab Kumar Saha et al., "A Raspberry Pi Controlled Cloud Based Air and Sound Pollution Monitoring System with Temperature and Humidity Sensing", 2018 IEEE

[4] Vineeta , Ajit Bhat , Asha S Manek , Pranay Mishra, 2019, "Machine Learning based Prediction System for Detecting Air Pollution", INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) Volume 08, Issue 09 (September 2019),

[5] G. Parmar, S. Lakhani and M. K. Chattopadhyay, "An IoT based low cost air pollution monitoring system," 2017 International Conference on Recent Innovations in Signal processing and Embedded Systems (RISE), Bhopal, 2017, pp. 524-528, doi: 10.1109/RISE.2017.8378212.

[6] Arushi Singh, Divya Pathak, Prachi Pandit, Shruti Patil, Prof. Priti. C. Golar, "IOT based Air and Sound Pollution Monitoring System", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, 2017.

[7] Menezes, Dennis,"IOT based Air and Sound Pollution Monitoring System." International Journal for Research in Applied Science and Engineering Technology. 7. 640-648. 10.22214/ijraset.2019.4117.

[8] Anjaiah Guthi, "Implementation of an Efficient Noise and Air Pollution Monitoring System Using Internet of Things (IoT)." International Journal of Advanced Research in Computer and Communication Engineering. DOI 10.17148/IJARCCE.2016.5747.

A Comparative Study of Electric Vehicle Charger And Battery Management System: A Review

Siddhesh Adavade
Automobile dept.
Saraswati College of Engineering
Navi-Mumbai, India
adavadesid1@gmail.com

Nikhil Shirsath
Automobile dept.
Saraswati College of Engineering
Navi-Mumbai, India
nikhilshirsath14@gmail.com

Nikhil Abraham
Automobile dept.
Saraswati College of Engineering
Navi-Mumbai, India

Rohit Shirudkar
Automobile dept.
Saraswati College of Engineering
Navi-Mumbai, India
rohitshirudkar227@gmail.com

Abhishek Jamnare
Automobile dept.
Saraswati College of Engineering
Navi-Mumbai, India
abhishekjamnare@gmail.com

***Abstract*— Lithium-ion battery pack technology is the current trend in the automotive industry. For this study, we compared the different materials of EV charger and BMS systems available, according to the working conditions of automobiles in India, where aspects like, fuel efficiency, cost-effectiveness, charging capabilities and ease of maintenance were the prime factors taken into consideration. The study has been divided into two parts i.e. Battery management system and EV Chargers. The principle commitment of this work lies in the similar investigation of these frameworks, to choose a particular setup for the utilization of small commercial vehicles like farm haulers, pickup trucks and ATV's. This study shall help anyone interested in using BMS and EV charger information for their projects and wants to understand different ways to manage their cost which affect the selection procedure depending upon the application of the user.**

Keywords*— *Battery Management system, Electric Vehicle Chargers, EV technology, Lithium-ion battery

I. INTRODUCTION

In the past decades, battery-pack technology in an automobile continues to maintain their place in the literature, due to their wide range of uses in different segments of automobiles. The battery management system is usually classified by comparing two parts based on its Architecture and based on cell balancing. In architecture, it is further divided into two parts i.e. centralized and decentralized whereas in cell balancing it is divided as active cell balancing and passive cell balancing. In EV chargers there are different types of charger available, like level 1, level 2, level 3, solar chargers and wireless chargers.

BMS is utilized to effectively screen cell-capacity and shield the battery pack from overcharging. Electric vehicles are observed as an alternative option in response to the depletion of resources. To increase the use of EVs, practical and reliable methods to charge batteries of EVs are absolutely important. So in battery chargers, there are two methods of charging that is conductive charging and inductive charging which are used. And also different charging strategies are used such constant current and constant voltage. This study tries to focus on various possible ways to assemble a lithium-ion battery pack bearing in battery management and battery charging solutions.

II. BATTERY MANAGEMENT SYSTEM

A BMS is utilized to screen and control cycles of energy storage in a battery pack. It empowers their working as far as might be feasible, making the battery pack a dependable and stable source of electric energy. They are portrayed by high thermal management, high efficiency and elevated level of safety their principle work is to forestall any harm to the battery as far as overcharging, unnecessary discharging or surpassing battery temperature limits [1]. It also performs as a meter to gauge the battery charge levels at all times. The comparison of BMSs is based on its two different aspects i.e. 'Cell balancing' and 'Architecture'. Cell balancing can be of two types, Active and Passive, while the architecture can be classified into Centralized and Decentralized BMS as shown in Fig.1.

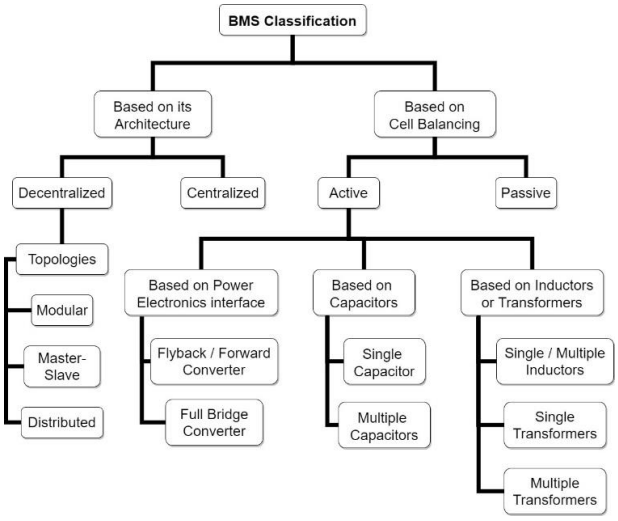


Fig. 1. Flowchart of BMS classification

A. Active balancing

"An active balanced cell generally transfers energy from one cell to another. It is from high voltage or high

SoC cell to a cell with a lower SoC" [2]. The purpose behind an active method is the transformation of the overcharge from the overcharged cell to the undercharged cell [1]. It efficiently balances cells without wasting all the energy as heat, with tiny energy converter circuits [2]. "Energy converters use transformers and inductors to move energy between cells in the battery pack. Active balancing can be categorized further based on its components i.e. Capacitors, inductors or transformers and power electronics interface" [2].

1) On the basis of capacitors

Single capacitors – In this method, "a single capacitor is used regardless of the number of cells connected in the battery. However, this method requires a large number of switches and intelligent controls" [3]. Multiple capacitors – "This method uses multiple capacitors connected to each cell. It transfers unequal cell energy by multiple capacitors and does not require a voltage sensor or closed-loop control" [2].

2) On the basis of inductors or transformers

Inductors – "A single inductor has a small volume and low cost, while multiple inductors have fast balancing speed and decent efficiency" [2]. Transformers – "A single transformer has fast balancing speed with low magnetic losses, whereas with multiple transformers equalizing speed is fast but it requires an expensive and complex circuit that prevents the transformer from being flooded" [2].

3) On the basis of power electronics

Flyback/forward converter – "In this method, the energy of a high voltage cell is stored in the transformer, which gives it high reliability" [3]. Full-bridge converter – "This method balances cells fast and with high efficiency" [2].

B. Passive balancing

A passive system balances cells by burning off the excess energy from the high cells with the help of a resistive component until the charge coordinates the lower energy cell in the battery [2]. The voltage values are monitored in the microcontroller with the help of an AC converter [1]. If the voltage of any cell exceeds the voltage of other cells, a proper key is shut [1]. "It causes a discharge of the battery by a component of the passive balancing circuit for example by a resistor, connected in parallel to each cell and it goes on until the voltage evens out between all cells" [1]. The long term effects of passive balancing on battery cell capacity.

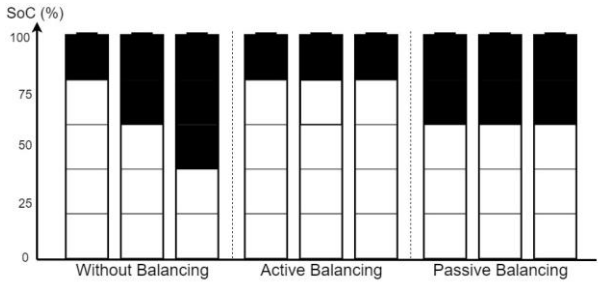


Fig. 2. Battery cell capacity after a few thousand cycles without cell balancing, with active balancing & with a passive balancing

C. Centralized BMS

"Centralized BMS is a single central pack controller that monitors, balances and controls all the cells in a battery. The entire pack is fixed on a single assembly from which the wire harness (N+1 Wires for N cells in series and temperature sense wires) goes to the cells of the battery. These wires are used for cell voltage, temperature measurement and balancing. The board does not require any external power supply; it is commonly powered by the battery output. It consists of multiple analog to digital converter (ADC) channels as part of the cell monitoring circuitry. The cell monitoring circuitry is also coupled with an intelligence circuitry. It is responsible for internal communication with the cell monitoring circuit for data acquisition. It computes the battery SoC and SoH and controls the power distribution unit (PDU) and external communication" [3].

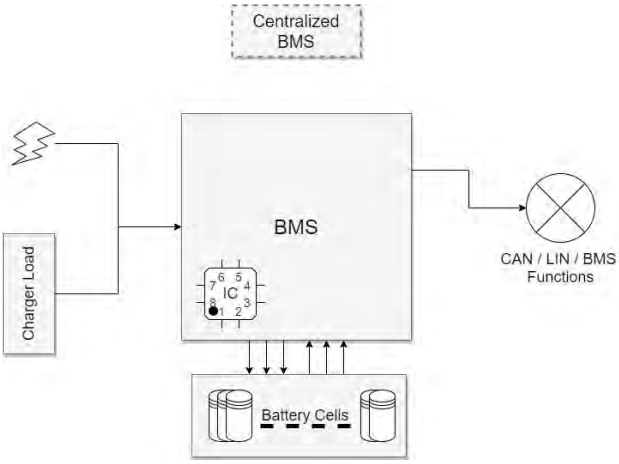


Fig. 3. Circuit diagram of Centralized BMS [2]

D. Decentralized BMS

"A decentralized BMS fundamentally does not have the entire cell monitoring and intelligence circuitry on a single assembly" [3]. These structures are of various topologies as follows.

1) Modular

Here, the battery management system is separated into multiple identical modules each going through several wires to the cells in the pack [2]. In this one module is assigned as a 'Master' and it deals with the whole pack and communicates with the remainder of the framework [2]. Different modules go about as a remote measuring device [2]. A correspondence link is used to transfer reading from the other modules to the master modules.

2) Master-slave

It consists of a master and a slave BMS unit. "The slave unit Monitors, balances and controls a group of battery cells within the battery modules. It communicates with the master unit through the communication interface. The master unit controls the state estimation, controls power distribution unit (PDU) and external communication. A master-slave BMS is the same as the modular system as it uses multiple identical modules (Slaves) for measuring the voltage of a few cells. However, the master is different from the modules

and does not measure the voltage as it only handles computation and communication".

3) Distributed

"This is different from the other two topologies. In other topologies, the electronics are grouped and placed separately from the cell, but in a distributed BMS the electronics are contained on cell boards that are directly placed on the cells that are being measured. Instead of using many tap wires between cells and electronics, a distributed BMS uses just a few communication wires between the cell boards and a BMS controller which handles computation and communications.

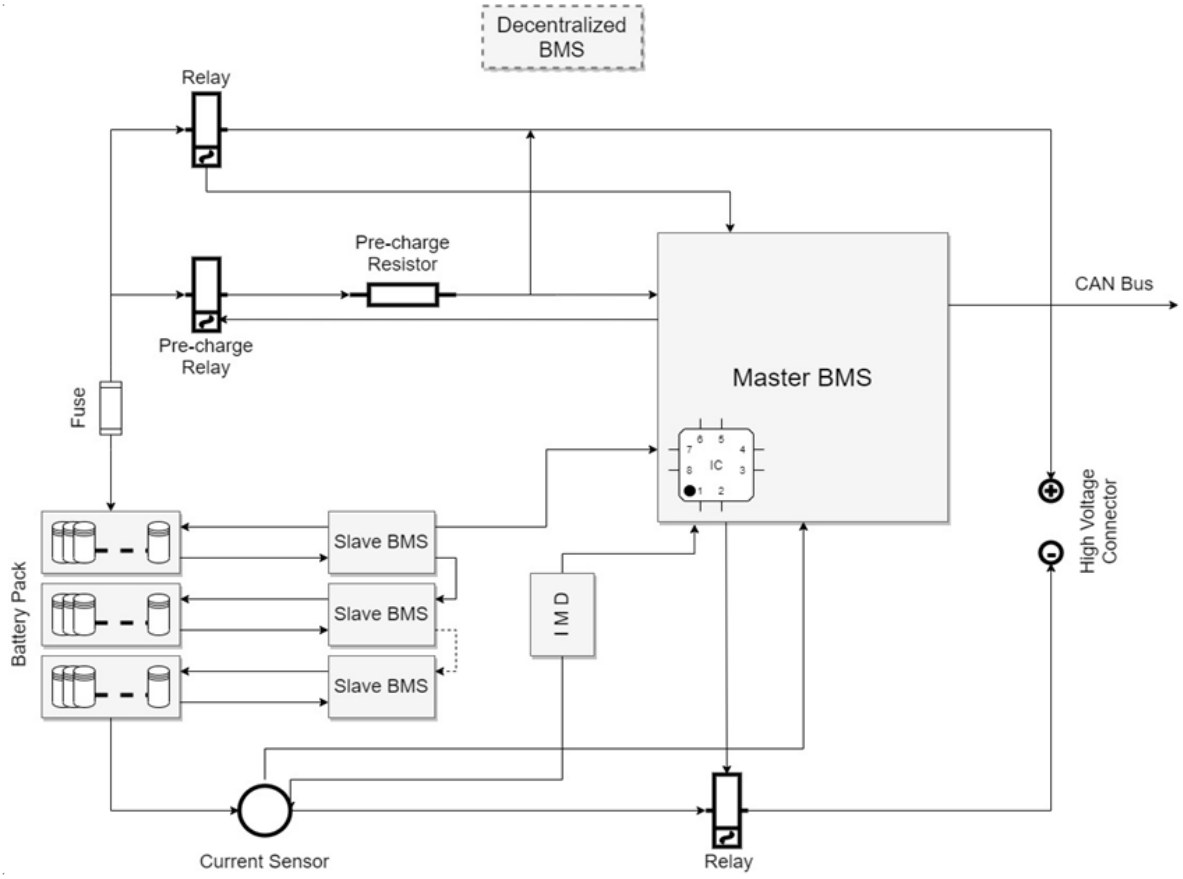


Fig. 4. Circuit diagram of Decentralized BMS

III. EV CHARGING SYSTEM

EV Charger is an electric device which is used to convert AC energy to regulated DC to restore energy in energy storage device i.e. the battery pack. "Because of the rapid growth in the usage of portable electrical devices in recent years, a simple and effective battery charger for these devices has become essential" [4]. "The lithium-ion (Li-ion) battery has become the most common power source for many portable devices because of its high specific energy and high operating voltage" [4]. The main components of any EV charger are – Charger control unit, charging cable, Vehicle control unit.

A. Types of charging

Generally, there are three distinct ways of charging a Conductive charging, Inductive charging, Battery trading. In Conductive Charging, the battery pack is associated with a charging link and plugged directly into an electrical outlet. Inductive Charging additionally called 'Wireless Charging' or 'Cordless Charging', utilizes electromagnetic induction to give power to a versatile gadget, these make an AC in a secondary coil in the portable device. In Battery exchange system (BES), the discharged battery gets swapped with a new completely energized battery at a battery trading station. But for this one must require the standard dimensions of a battery pack.

It can also be defined by "Battery exchange system (BES) where the entire Battery pack is replaced and when the battery is replaced in the BES, the empty battery is assumed to be recharged with CC while the vehicle returns to work with a fully charged battery pack, meaning that BES still needed a CC system. The time required for the replacement of a battery pack is approximately 10 minutes" [7]. There are three levels of chargers for EV i.e. Level1, Level2, Level 3 in general as shown in Table. 1, Level1 and Level2 chargers are utilized for "convenience charging" for example charging where and when a vehicle would ordinarily be left for extended periods. While DCFCs can be utilized to broaden a BEV's reach immediately [9].

1) Level 1 Charger

"It uses a standard 120 V source and can supply 2-5 miles of range per hour of charging at about 1.4-1.92 Kw" [9]. Level1 charger is a low cost & portable EV charger, which can be taken anywhere with the user and can be plugged at any household. "The most widely used charging strategy constant current (CC) and constant voltage (CV) i.e. (CC-CV) and there are special integrated circuits to handle the charging mechanism.

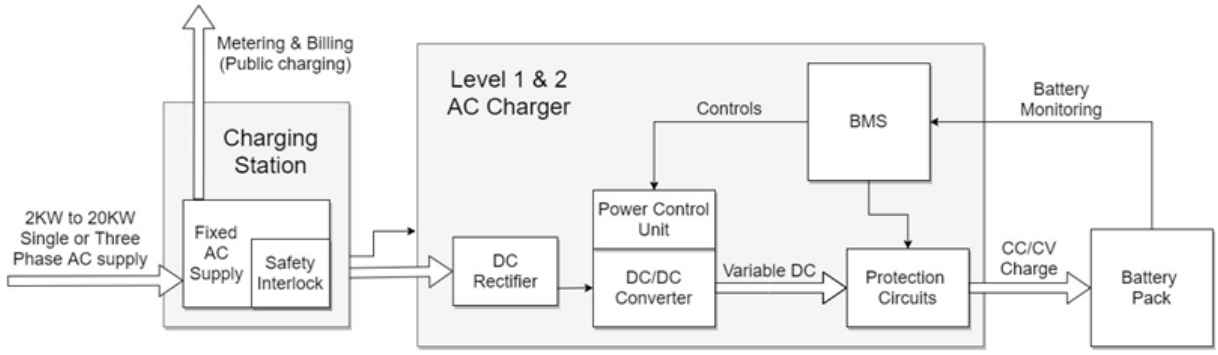


Fig. 5. Block diagram of AC level 1 & level 2 charging systems

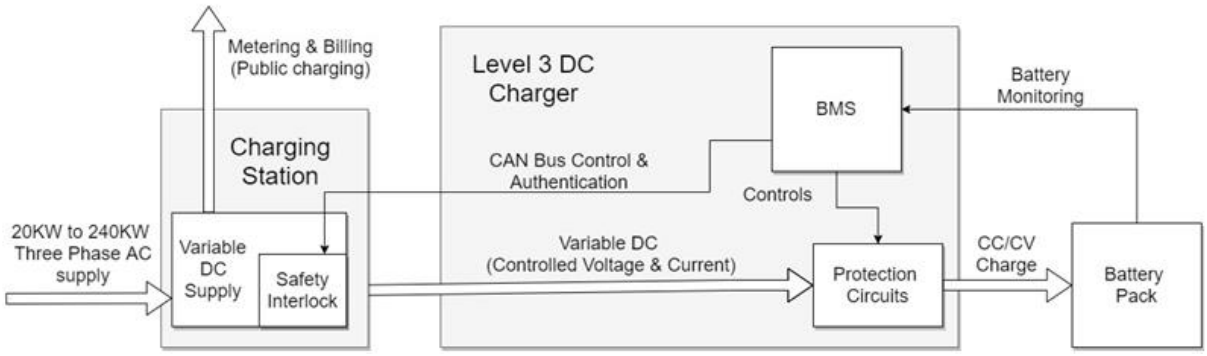


Fig. 6. Block diagram of the DC Level 3 charging system

2) Level 2 Charger

"It requires a 40 V source and can supply 10-60 miles of range per hour at 7.2-19.2 kW" [9]. Public level2 chargers can offer comparable assistance to DCFC when and where vehicles would regularly be parked for extended periods away from their place of residence or work area [9]. Level2 charger is used to charge private vehicles which are medium in cost when compared to other vehicles. They have specified charging stations with charging speed faster compared to level1 charger or user can even install a level2 charging station in their household. The structuring of level2 charger is as shown in fig .5.

3) Level 3 Chargers

"Level 3 charger consists of Direct current fast charging (DCFC), which requires a 480 V source and can supply 60-100 miles of range in 20 min at 40-110 kW" [9]. "Charging stations are designed to charge the electric vehicles and they are classified under different standards. These standards are set by international institutions such as the International Electrochemical Commission (IEC), Society of Automotive Engineers (SAE) and CHAdeMO, depending on the defined technical data and qualifications. The standardized classifications set by the institutions for the electric vehicle. Charging electric vehicles with high power will have negative effects on the grid. To minimize these effects, the charging stations can be supported by local energy resources and the need for the grid can be reduced. Besides, it is also possible to make a bi-directional energy flow with the grid" [10]. The structuring of level3 fast charger is as shown in fig.6.

B. Solar Charging Stations

Solar stations have grid integrated PV power generated with an energy storage system which needs two types of conversions required i.e. DC-DC & DC-AC. A DC-DC converter is used to store energy in the battery from both photovoltaic modules & grid. The DC-DC converter is accountable for adjusting the battery output voltage to the appropriate inverter input voltage. Additionally, the voltage in the inverter at the input is fixed to a consistent level, autonomous of the voltage variety in the battery output because of its State-Of-Charge. The DC-AC inverter is utilized to connect the output of the DC-DC converter (battery or photovoltaic panel) to the grid [5]. "The single-phase AC-DC converter provides inherent low-frequency ripple in grid current. A large DC-link capacitor is used to filter the input power fluctuation" [6]. "The EV charger is

connected to the power grid via a passive filter at the front-end while interacting with the EV lithium-ion controller of the DC-DC converter can manipulate the duty ratio (D) to control the battery current, which in turn controls the charging power of EV battery; it can be observed that a regulated DC-link voltage (VDC-link) further simplified the control of the DC-DC converter by keeping the input voltage to the buck converters as a constant. A regulated DC-link voltage was also essential to realize the implementation of the power grid voltage regulation utilizing the reactive power supply from the DC-link capacitor. Therefore, the DC-link voltage control will be employed as one of the objectives in the controller of the AC-DC converter" [7]. If sustainable energy, for example, biogas, sun based or wind power is utilized for charging EV. Charging and working of EV will be CO2 neutral and very conservative. Simultaneously, the high-capacity grid. EVs can be recharged with battery can store abundance energy and feed it back into the environmentally friendly power like sun based and wind energy at home, working environment or public charging stations [10].

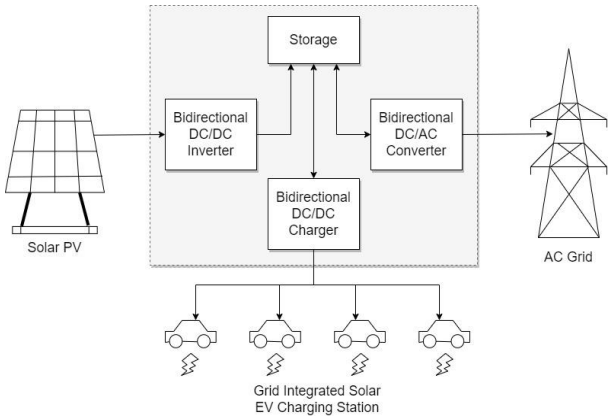


Fig. 7. Schematic of solar charging infrastructure [10]

IV. Results and Discussion

In this review, the outline of Electric vehicle chargers and BMS is given. Characteristics of different BMS and charger components like Active balancing, passive , one has to choose between active and passive balancing. Active balancing is the more efficient option. But for cost efficiency passive balancing is the best option. For the structural representation, there are centralized and decentralized BMS. Between which centralize is less costly but looks more complex and decentralize is most efficient among this but is costlier.

Level1 charging works from a single-phase AC electrical plug appropriate for the private establishment and need not bother with verification and charging framework. Level2 charging station may either utilize single-phase or three-phase AC power from the network. The independent framework utilized for level1 and level2 gives the charger the adaptability to interface with various AC charging sources, even though the most concerning issues are the absence of charging stations and charging norms. So to overcome this issue Level1 charger is the best solution for it, as it is portable and can be plug at any 3 phase power supply and provide high voltage current.

battery at the back-end Fig. 14. The balancing, centralized BMS, Decentralized BMS, Level 1, level 2, level3 charger are described. Different types of Electric vehicle charger that are currently present in the market are compared depending on different factors. We can say that the characteristics of present Li-ion batteries can vary between different chemistries. Similar to the thermal management system, the battery management system helps the battery pack to work efficiently. It helps with power controlling which prevents sudden overload of current. It also monitors the battery cells during charging and discharging cycles. The study shows that the BMS needs to be precise and selected well, according to the structuring of the battery pack. Some BMSs could offer more control by splitting up into modules, while some use a single chip which costs less but has more wiring work, making it more complex.

The final aspect of this study was the chargers used for battery pack charging. Characteristics of different chargers like level1, level2 and level3 charger of an electric vehicle are been described along with their specification, they are categorized under slow charging and fast charging. In low power i.e. level1 and level2, "the power conditioning which includes the AC to DC conversion, the power control unit which delivers a variable DC voltage to the battery and various filtering functions are all carried out within the charger and can be implemented at a relatively low cost. It controls the charging rate to provide the required constant current / constant voltage (CC/CV) charging profile. Commercial electric vehicles need bigger batteries which need higher power charging stations to achieve reasonable charging times, it requires a high power conditioning and control circuits become very large and expensive requiring heavy-duty components" [11], so in this case level, 3 fast chargers are used.

V. Conclusions

In this study, Review of Electric vehicle charger and BMS. Is been noted. BMS are extremely useful for ensuring the safety of the battery packs. But it is also based on the requirement of the user as there are various BMS available accordingly. As the cell balancing is the most important in a BMS

Acknowledgement

This study was supported by ''Saraswati College of Engineering", Kharghar and guided by our project guide Prof. T. Z. Quazi.

References

[1] P. Deja, Tests of BMS Battery Management System with active and passive system of balancing the battery capacity. IOP Conf. Series: Materials Science and Engineering 679 (2019) 012009.

[2] https://www.ionenergy.co (2020).

[3] M. Singh, R. Khurana, P. Jain, Low cost high voltage battery string monitoring system, Int. Conf. on Computing and Network Communications (2015) 879-883.

[4] K.M. Tsang, W.L. Chan, A simple and low-cost charger for lithium-ion batteries, Journal of Power Sources 191 (2009) 633–635.

[5] J. Gallardo-Lozano, M. I. Milanés-Montero, M. A. Guerrero-Martínez, E. Romero-Cadaval, Electric vehicle battery charger

for smart grids, Electric Power Systems Research 90 (2012) 18–29.

[6] Liwen Pan, Chengning Zhang, Performance Enhancement of Battery Charger for Electric Vehicles Using Resonant Controllers, Energy Procedia 105 (2017) 3990–3996.

[7] J. Y. Yong, S. M. Fazeli, V. K. Ramachandaramurthy, K. M. Tan, Design and development of a three-phase off-board electric vehicle charger prototype for power grid voltage regulation, Energy 133 (2017) 128-141.

[8] Onur Elma, A dynamic charging strategy with hybrid fast charging station for electric vehicles, Energy 202 (2020) 117680.

[9] O. Lagnelov, G. Larsson, D. Nilsson, A. Larsolle, Per-Anders Hansson, Performance comparison of charging systems for autonomous electric field tractors using dynamic simulation, Biosystems Eng. 194 (2020) 121–137.

[10] D. L. Greene, E. Kontou, B. Borlaug, A. Brooker, M. Muratori, Public charging infrastructure for plug-in electric vehicles: What is it worth?, Transportation Research Part D 78 (2020) 102182.

[11] https://www.mpoweruk.com(2020)

Solar Water Heating System

Swapnil Yadav
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
swapnilyadav718@gmail.com

Subodh Yadav
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
subodh16728@gmail.com

Sejal Yadav
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
sejalyadav2012@gmail.com

Ankita Kumari Yadav
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
ankitay2172001@gmail.com

Aniket Yadav
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
aniyad304@gmail.com

Aditya Yadav
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
2001adityayadav@gmail.com

Megha Gupta
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
megha.gupta@thakureducation.org

***Abstract* — Sun oriented energy is made by light and warmth which is produced by the sun, in the type of electromagnetic radiation. With the present innovation, world is ready to catch this radiation and transform it into usable types of sun-oriented energy for example, heat or power. Sun powered energy can be utilized for heating water. Warming water for washing, dishwashing, and clothes washing is the second biggest home energy cost [1]. Solar water heaters plays an important role in both the sectors (domestic & industrial) because of the ease of operation & cost maintenance[2]. Introducing a sun-based water heater can decrease the water heating bill. This paper expands upon past examinations of sun-based water radiator. It targets offering a refreshed image of current innovation, just as new examinations on how sunlight-based energy advances for heat. The size of the frameworks relies upon accessibility of sun-based radiation, temperature prerequisite of client, topographical condition and course of action of the nearby planetary group, and so on subsequently, it is important to plan the sun-oriented water heating framework according to above boundaries.**

Keywords — Solar energy, electromagnetic radiation, Water heater, Solar radiation.

I. INTRODUCTION

Renewable energy is a clean & green energy and the most promising alternative technology which promotes sustainable development[3]. The solar energy is abundant all over the world and moreover in India especially. This solar energy must be used in such a way that the consumption of electricity can be gradually minimized. Solar energy, in comparison to other renewable sources of energy, is freely available energy source for managing long term issues in energy crisis[4]. The increase in the demand of electric energy and the concern about the impact caused by fuel use are stimulating researches and development of systems related to alternative sources of energy such as the solar energy. A solar water heater could be defined as a particular device that stores sunlight to heat the water.

It can be a more economical way to produce hot water for the family. A solar heater provides substantial savings of energy as the solar power is absolutely free in comparison to natural gas or fuel oil. Solar thermal for water heating systems is one of such key initiatives for buildings. Essentially, the amount of solar energy that the earth absorbed in 1 hour is more than the total amount of energy consumed by the earth in 1 year. This makes solar thermal is the most abundant source of energy. Unfortunately, due to low efficiency of solar thermal collectors and inefficient operation of the heating system, the water heating systems in most buildings still heavily rely on electricity from the power grid for heating water. So, in this way solar water heater could definitely make an impact.

II. LITERATURE SURVEY

The historical backdrop of utilizing the sun for energy goes route back to the Ancient Greeks and Romans as their structures were built with the end goal that the beams of the sun gave light and warmth to indoor spaces [5]. The Greek rationalist Socrates expressed, "In houses that look southward, the sun enters the passage in winter." Romans progressed this craftsmanship by covering the openings to south-bound structure with glass, to hold the warmth of the colder

time of year sun. The historical backdrop of using sunlight-based energy as of late dates from 1861 when Mouchout built up a steam motor controlled completely by the sun and in 1883 American innovator Charles Fritts depicted the main sun powered cells made of selenium wafers. The Arab oil ban in 1973 affirmed how much the western economy relied on there, being a modest and solid progression of oil.

During the 1970s it was felt that through huge interest in subsidizing and exploration, sun powered photovoltaic expenses could definitely decrease, to such an extent that in the long run sun-based cells could get serious with petroleum derivatives. During the 50's Israeli designer, Levi Yissar, recommended the utilization of sun powered energy for warming up homegrown water with Israelis reacting by the mass buying of sunlight-based water radiators. By 1983, 60% of the populace warmed their water from the sun[5]. At the point when the cost of oil dropped during the 1980s, the Israeli government required its occupants to warm their water with the sun. Today, over 90% of Israeli family units own sun powered water radiators. By the 1990s, the truth was that the expenses of sun powered energy had dropped as anticipated and the immense PV market development in Germany and Japan from the 1990s to the present has helped the sun-oriented industry.

Moreover, such enormous PV creations are making consistently bringing down expenses. Then, the warming of water by sun-oriented energy is an undeniably financially savvy methods for bringing down gas and power interest[5]. In the nineteenth century, individuals utilized an oven to warm water by consuming bits of wood or coal. In urban communities, the richer warmed their water with gas produced from coal. In numerous territories, wood, coal or gas couldn't be effortlessly gotten and subsequently such powers were regularly costly. To stay away from these issues, a lot simpler and more secure approach to warm water was made. This was accomplished by putting outside a dark painted metal tank brimming with water to retain sunlight-based energy. The detriment was that even on clear sweltering days it as a rule took from morning to early evening for the water to get blistering.

As the sun went down, the tank quickly lost its warmth since it had no protection[5]. The historical backdrop of Solar Water Collectors in Greece began when the principal authorities were imported from Israel during the 70's. The Greek Solar Industry Association was set up in 1978 and the advancement of universes began around a similar period. The innovation of the Solar Water Heaters was to a great extent acknowledged by the market and little units of 2m2 were introduced to cover the requirements of a family.

III. CURRENT SOLAR SYSTEM

Solar technologies are generally gathered into three major classes, by and large contrasting in the ways they gather, store and use energy. Passive solar frameworks include direct use of the sun's radiation as light or potentially heat [6]. Models incorporate energy proficient windows, bay windows, greenhouses, and mixture lighting installations, which use fiber optic cable to transmit daylight into inside rooms. Next are solar thermal, which gather and use the sun's energy as warmth. They are not quite the same as immediate heating in their ability to store thermal energy for some other time use. Current applications incorporate domestic and industrial water heating, air and space heating, brilliant section heating, and even the activity of warmth pumps and sterling engines. The energy and the temperature level needed to be provided to do ordinary errands will fluctuate. For the most part, a domestic hot water supply at temperatures in the scope of 50 to 60 degree Celsius is considered to be worthy[5].

IV. TYPES OF SOLAR WATER HEATERS

Solar water heating systems are grouped relying upon how the homegrown water is warmed or how the warmth move liquid (water or liquid catalyst liquid) moves through the authority. In light of this, there are essentially two kinds of solar water heating systems, specifically; Direct (open circle) and Indirect (shut circle) water heating systems which can either be passive or active.

Direct systems heat up water as it streams straightforwardly in the gatherer whiles circuitous systems heat up water through a warmth exchanger utilized between the authority and the boiling water stockpiling tank. Active systems utilize electrically determined siphons to circle water or another warmth retaining liquid, and in some cases utilize electrically worked valves for freeze assurance.

Passive systems

In passive systems, heated water is either put away in the actual authority or is moved to a capacity tank situated over the gatherers by methods for a thermo syphon [7]. Passive systems don't utilize siphons to circle water or gatherer liquid. Two sorts of passive systems; thermo syphon systems and vital authority stockpiling systems are momentarily portrayed beneath.

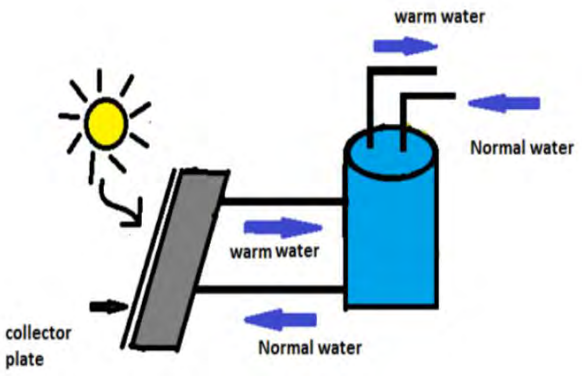


Fig 1. Passive System

Thermo syphon systems: An ordinary thermo syphon framework is shown in Figure.2 Around 30% households all over the country have installed such systems [8]. As the sun radiates on the authority, the water inside the gatherer stream tubes is warmed. As it

warms up, this water grows marginally and gets lighter than the virus water in the solar stockpiling tank mounted over the authority. Gravity at that point pulls heavier, cold water down from the tank and into the authority bay. The virus water pushes the warmed water through the gatherer outlet and into the highest point of the tank, subsequently heating the water in the tank. A thermo syphon framework requires neither pump nor regulator. Cold water from the city water line streams straightforwardly to the tank on the rooftop. Solar warmed water streams from the roof tank to the helper tank introduced at ground level at whatever point water is utilized inside the home. This framework includes a thermally worked valve that shields the authority from freezing. It additionally incorporates confinement valves, which permit the solar framework to be physically depleted if there should be an occurrence of freezing conditions, or to be skirted totally.

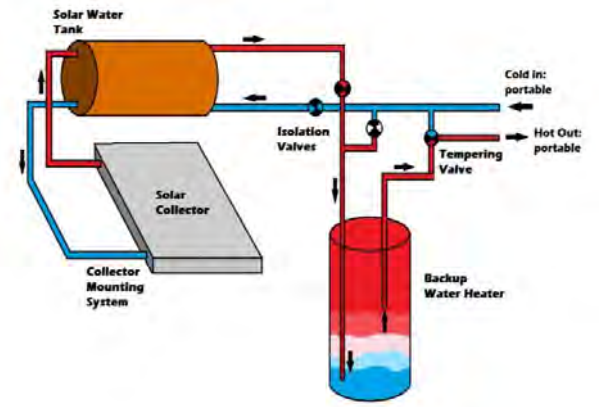


Fig 2. Thermosyphon system

Integral Collector Storage (ICS) Systems: Technological research is still in the continuous development process in solar domestic hot water (SDHW) systems market [9]. In essential collector storage (ICS) or cluster systems, water is warmed straightforwardly by the sun and the capacity tank fills in as the solar collector. Group water warmers are quite often passive systems in which hot water is conveyed from the solar warmed tank to a reinforcement tank or the purpose of utilization by the water pressure in the house. Most plans utilize neighborhood fundamental water strain to circle water in the collector. Water may likewise stream because of lightness powers set up because of differential heating on the collector and valves control the stream heading. These systems are moderately less expensive than thermo syphon systems. The framework is basic since siphons and regulators are not needed. On interest, cold water from the house streams into the collector and high temp water from the collector streams to a standard boiling water helper tank inside the house. A freeze security valve introduced in the top pipes close to the collector opens to permit moderately warm water to move through the collector to forestall freezing.

Direct active systems: Direct (Open Loop) Active Systems are like thermo syphon systems in that they are direct systems that utilization a solar collector separates from the capacity tank. Water which is used as the working fluid, is heated within the collector having the range of the of 50-60ºC [10]. The distinction with direct active systems is that they utilize an electric siphon to course water from the capacity tank to the collector, and back to the capacity tank. These systems consistently require a check valve to forestall turn around thermo syphoning around evening time.

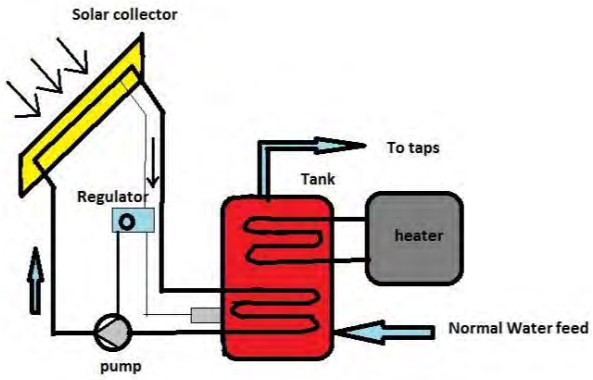


Fig 3. Direct active systems

Indirect active systems: Glycol radiator fluid systems are active, indirect systems with a heat exchanger. Freeze safe propylene glycol is circled through the solar collector(s) and heat exchanger, while family water is flowed from the storage tank through the heat exchanger. The family water is heated inside the heat exchanger and afterward put away inside the tank until required. The radiator fluid and water (if an outside heat exchanger is utilized) are circled utilizing either AC siphons fueled from the utility matrix or DC siphons controlled by a solar electric PV module. The most well-known sorts of solar water heating framework in temperature climate locales are indirect active systems fundamentally to secure the systems against freezing. Direct active systems are utilized in heat and humidities where freezing isn't an issue and homegrown water is dealt with, or in cases water is taken care of directly from water utility stock line (which ordinarily treats homegrown water). Active framework whether direct or indirect can be effortlessly retrofitted to previously existing water heaters in light of the fact that the storage tank can be set at any spot not at all like thermo syphon systems which require a storage tank consistently over the collector.

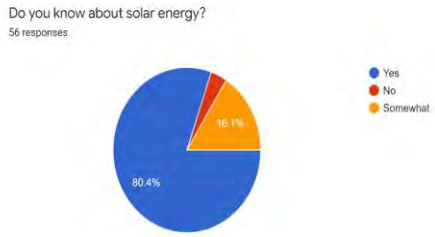
V. BENEFITS OF SOLAR WATER HEATER

The energy saved by using a solar water heating system helps to minimize domestic demand of energy from the power utilities. A solar water heater is absolutely a long-term investment that will be able to save money which is spent on solar water heating system after it has paid for itself. In addition to the cost savings from water heating & reduced electrical energy, there are several more benefits derived from using the sunlight to for

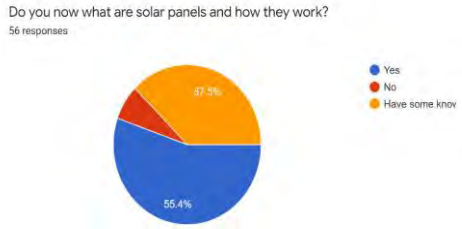
water heating process. Several water heaters come along with the additional water tank that feeds the conventional water tank (hot). Users getting the benefit from the larger storage of hot water capacity and the decreased likelihood of running out of hot water. Few solar water heaters don't require electricity for the operating purpose. For such kind of systems, hot water supply is safe from power cutoffs, till there is sufficient light of sun to operate the system. Solar water heating systems can also be used to directly heat swimming pool water, along with the added benefit of extending the swimming season for outdoor pool applications.

VI. RESULT & DISCUSSIONS

A survey was conducted on the solar energy, the solar water heater& its types to know that whether people are actually interested in using solar water heater in place of electric water heater and to make them aware about using water heaters and how it will be useful in future. Here are the details of some of the questions that were asked and the responses that were received:

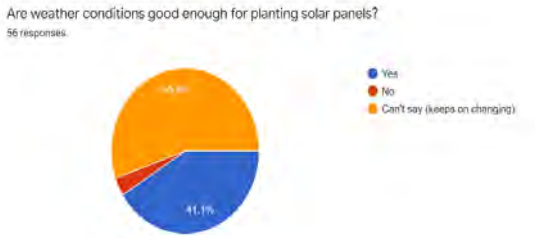


In this 80.4% of the people know what is solar energy which is a good point, as further process of setting it up would be easier.

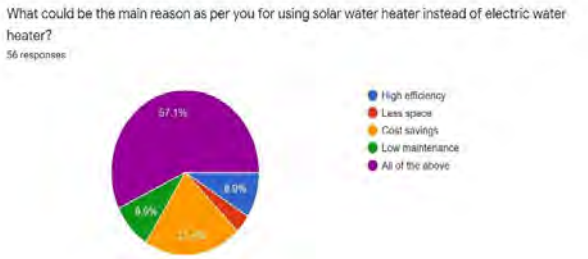


55.4% people are aware with the concept of solar panels and their workings, 37.5% people have some knowledge of it and 7.1% are unaware of it.

This graph shows that the major people are from which city as this is how it can be determined that whether it is a good idea to plant a solar water heating system over there or not.



This chart shows the data of the people living in the areas that whether it is a good place to plant a solar water heater or not.



This chart is having the information of the people thinking about the advantages of solar over electrical (majority goes with All of the above part).

This is how a complete data was obtained regarding that whether planting a solar water heater to these particular cities is a good idea or not.

VII. CONCLUSION

Renewable energy research has become progressively significant since the marking of the Kyoto Protocol. Solar water heating (SWH) is quite possibly the best advances to change over solar energy into thermal energy and is viewed as one of the popularized innovations. Nonetheless, there exist some improvement in the framework execution to expand its dependability and proficiency. A compact audit fundamentally on the plan highlights and related specialized headways of the SWH frameworks in terms of both energy proficiency and cost adequacy has been introduced. A few sun based water warming plans have been presented on the lookout and are more normally used in the tropical locales of creating nations.

Late improvements in warmth pipe-based sunlight-based authority innovation display a promising plan to use sunlight-based energy as a solid warming hotspot for water warming applications in sunlight based unfriendly districts. Warmth pipe-based sun powered water warming is impacted by numerous elements including the idea of the refrigerant, because of the ecological concerns). Meaning of Kyoto Protocol: an international agreement that aims to reduce carbon dioxide emission and presence of greenhouse gases.

VIII. SCOPE OF PROJECT

The solar water heater market is relied upon to develop at a CAGR of more than 5.1% over the time of 2020-

2025. Decision of size, less space, high efficiency, cost reserve funds, low maintenance, also lower carbon footprint are probably going to drive the solar water heater market during the forecast time frame. Governments are pushing for plans to push for solar water heater to reduce emissions from gas fueled water heater and district heating system.

IX. ACKNOWLEDGEMENT

We would like to acknowledge Thakur College of Engineering and Technology for providing such a kind of platform where the participants can enhance their skills regarding paper presentation and many more. We also acknowledge Mrs. Megha Gupta for guiding us regarding paper presentation.

REFERENCES

[1] Chandan Sharma, Shailendra Kumar Bohidar , Prakash Kumar Sen" Study Of Solar Energy & It's Application In Daily Life." IJARSE, Vol. No.4, Special Issue (01), April 2015.

[2] Jaisankar, S., et al. "A comprehensive review on solar water heaters." Renewable and Sustainable Energy Reviews 15.6 (2011): 3045-3050.

[3] Damini, M., B. Kasturi Bai, and V. Kirubakaran. "A concept note on solar water heater integrated vacuum desalination unit for institutional purpose." 2016 International Conference on Energy Efficient Technologies for Sustainability (ICEETS). IEEE, 2016.

[4] Kannan, Nadarajah, and Divagar Vakeesan. "Solar energy for future world:-A review." Renewable and Sustainable Energy Reviews 62 (2016): 1092-1105.

[5] Vinubhai, Tadvi Sachin, R. J. Vishal, and K. Thakkar. "A review: solar water heating systems." The National Conference on Emerging Vista of Technology in the 21st Century, Limda, Vadodara. 2014.

[6] Compagnon, Raphaël. "Solar and daylight availability in the urban fabric." Energy and buildings 36.4 (2004): 321-328.

[7] Richardson, John L. "Passive solar water heater." U.S. Patent No. 4,587,952. 13 May 1986.

[8] Shariah, Adnan, and Bassam Shalabi. "Optimal design for a thermosyphon solar water heater." Renewable Energy 11.3 (1997): 351-361.

[9] Bilardo, Matteo, et al. "Design and experimental analysis of an Integral Collector Storage (ICS) prototype for DHW production." Applied Energy 259 (2020): 114104.

[10] Gong, J., and K. Sumathy. "Active solar water heating systems." Advances in Solar Heating and Cooling. Woodhead Publishing, 2016. 203-224.

This page is kept blank intentionally

IoT based Monitoring system for Efficient Irrigation using a Markov Decision Process

Ashutosh Patel
Electronics and Telecommunication Engineering
Thakur college of Engineering and Technology
Mumbai, India
s1032170502@tcetmumbai.in

Vinay Singh Rawat
Electronics and Telecommunication Engineering
Thakur college of Engineering and Technology
Mumbai, India
s1032170511@tcetmumbai.in

Deeksha Shriyan
Electronics and Telecommunication Engineering
Thakur college of Engineering and Technology
Mumbai, India
s1032170523@tcetmumbai.in

Mr. Nikhil Tiwari
Assistant Professor
Electronics and Telecommunication Engineering
Thakur college of Engineering and Technology
nikhil.tiwari@thakureducation.org

***Abstract*— In India, a vast majority of farmers manually control the irrigation process which usually relies on individual observation, experience as well as intuition. Also, conventional irrigation methods which are implemented using humidity thresholds-based actions appear to be slow and quite water consuming. This paper proposes a Markov Decision Process (MDP), a reinforced learning process perfect for such situations wherein only a part of the result is under the decisions maker's control. A WSN is used for monitoring soil moisture as well the temperature, humidity and detecting rainfall. The data is sent to the cloud platform, Thingspeak for data visualization and real time data is observable through an android application. The MDP can significantly reduce water as well as energy consumption by decisions based on the prediction of soil humidity. The amount of water that can be saved depends on the maximum and minimum threshold levels for a particular crop.**

Keywords*—WSN, Markov decision process, IoT, Irrigation, Precision Agriculture

I. INTRODUCTION

Agriculture is the soul of the Indian socio-economic fabric, being the main source of livelihood for about 58% of the population. India is the second largest producer of agricultural output after China, contributing more than 7% to the global agricultural produce. With nearly half of the workforce engaged in agricultural activities, agriculture contributes about 15% to the country's GDP. With a majority of the farmers practicing subsistence agriculture, most of them utilize conventional farming techniques involving physical monitoring of the crops which sometimes leads to overuse of fertilizers, inadequate/irregular/over irrigation, untimely detection of crop diseases or fungal growth, etc.

India envisions increasing the agricultural yield twofold by the end of 2022, albeit it is certainly possible with the present state of agriculture in India but to keep up with the ever-increasing demands of agricultural raw materials and food production the existing practices need to be innovated. Technological advancements like Artificial Intelligence, Machine learning, Cloud Computing, Robotics, IoT, Wireless Sensor Networks (WSNs) and Remote Sensing will play a major role in transforming the agricultural scenario. Companies specializing in robotics, drones, IoT, etc. have already started showing keen interest in investing in agriculture.

A minimalistic Arduino based system was used for recording parameters which were sent over to cloud for monitoring and a conventional threshold-based irrigation technique was used in [1]. Soil moisture sensor, relative humidity and temperature were measured and sent over to Thing speak. The study proposed a simple android application that could be used for real time monitoring in [3]. [2] proposed a Markov Decision Process (MDP) for irrigation which can save up to or more than 63% of water as well as power consumption compared to threshold-based decision. [4] gave an extensive review of published articles, white papers and existing solutions related to IoT in agriculture and the discussed applications of IoT and Data analytics into enabling smart agriculture as well as the benefits, challenges, open issues, and opportunities proved to be fruitful.

The paper proposes a WSN using Star topology for network simplicity. Relative soil moisture measured by the sensor nodes is sent to the central node and then over to the cloud platform Thing speak. The android app is developed to monitor the status of irrigation and other parameters. A Markov Decision Process is proposed for timely and efficient irrigation which has several important elements including states, actions, and probability & rewards for transitioning from one state to another through an action.

II. THE MONITORING SYSTEM AND FRONT END

A. Wireless Sensor Network

A Wireless Sensor Network (WSN) with a star topology is proposed for minimal network complexity. A star topology allows more efficient energy management and simplified network coverage analysis, complementarily, coordination and management are better when a central device is responsible for the process. A ZigBee S2C

transceiver will be utilized for communication between nodes which is composed by IEEE 802.15.4 in the lower physical and MAC layers as it is a low energy consuming protocol that supports only star and peer-to-peer topology. DHT11 sensor module is used to measure temperature and relative humidity, FC-28 soil hygrometer sensor will be considered for measuring soil moisture, FC-37 sensor will be used for rainfall detection. Arduino UNO board is considered as the microcontroller unit for each sensor node. The aggregator or the central node will utilize an Arduino Uno board as the processing unit and a compatible GSM module (SIM800C) to send data over to Thingspeak cloud platform.

B. Thingspeak and Android Application

ThingSpeak will be used as a cloud IoT hub for data acquisition and computing which is an open source IoT application that provides a reasonable, request-limited free license and utilizes MATLAB for data processing, analysis, and visualization. The real time data sent by the central node is written on a Thingspeak channel which can be read and analyzed by other web services and APIs. An android application was developed using python framework KIVY.

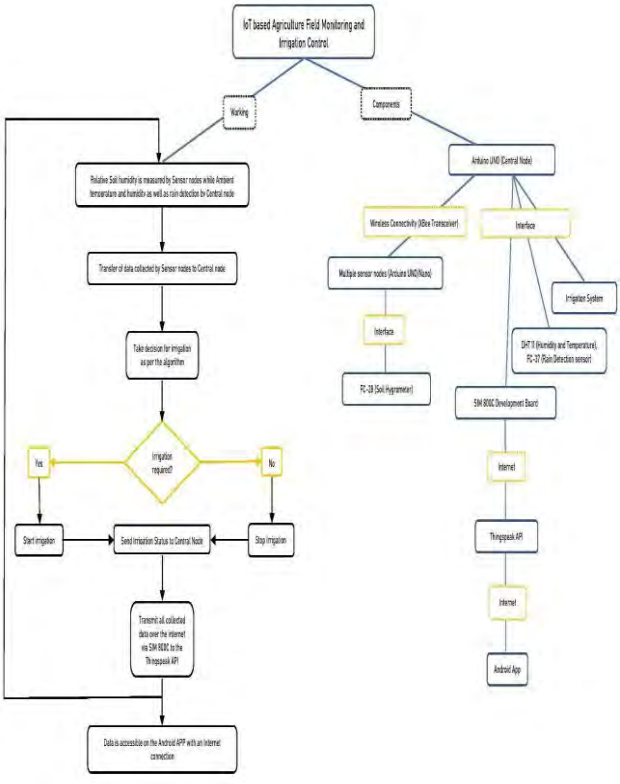


Fig. 1. Data flow diagram and interconnection between components

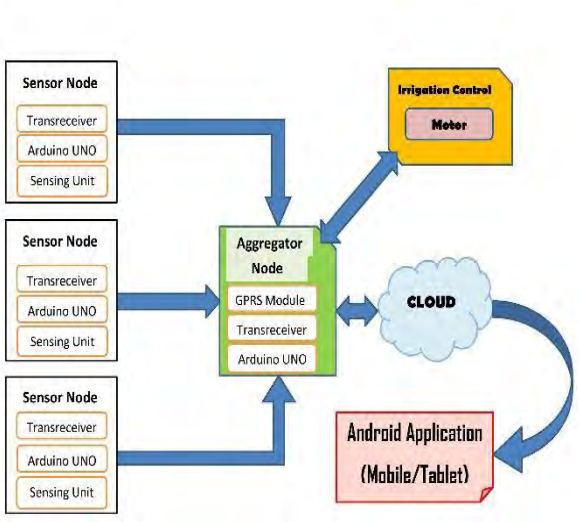


Fig. 2. Basic block diagram

III. IRRIGATION AND MARKOV DECISION PROCESS

A Markov Decision Process (MDP) is proposed for irrigation which is a mathematical model for decision making in cases that are partly random and partly under the control of decision makers. The process of Markov decision is a discreet process which will be governed by several major elements such as the state (*S*), action (*A*) to move from a state *S* to *S'*, reward {*R(S, S')*} for moving from state *S* to *S'* which is governed by a reward function. The aim of MDP is to find a policy (a function in *S*) such that the reward function is maximized when moving to next state. The data flow diagram in Fig. 1 gives a general idea of the control flow.

IV. RESULT AND EXPECTED OUTCOME

The WSN measures and updates the Thingspeak fields with a time gap more than the default (15 seconds) provided by the cloud platform to observe the changes in soil moisture content (Ideally 20-30 minutes or more). The following figure shows the visualization of collected data. A Sensor fault detection algorithm will be implemented to notice abrupt changes in measurements, enabling timely maintenance while preventing the system from unnecessary and poor decisions. The MDP will provide a better control for irrigation considerably saving water and energy.

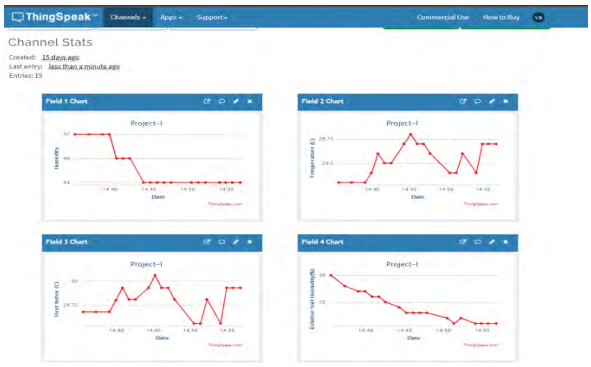


Fig. 3. Visualization of the data received.

V. CONCLUSION

An IOT based monitoring system for temperature, humidity, soil moisture, and rain condition was implemented using WSN, Android Application and Thingspeak platform. By using this project farmers will be able to increase the agriculture yield by maintaining the soil moisture at the optimum level at all times while saving energy and reducing water consumption.

The project can be improvised by introducing more types of sensors to perform more complex analysis of the crops including crop growth, disease detection etc. Machine Learning and AI can be implemented for predictive analysis of the crop growth.

REFERENCES

[1] A. Anitha, N. Sampath And M. A. Jerlin, "Smart Irrigation System Using Internet Of Things," 2020 International Conference On Emerging Trends In Information Technology And Engineering (Ic-Etite), Vellore, India, 2020, Pp. 1-7, Doi: 10.1109/Ic-Etite47903.2020.271.

[2] T. K. Toai and V. M. Huan, "Implementing the Markov Decision Process for Efficient Water Utilization with Arduino Board in Agriculture," 2019 International Conference on System Science and Engineering (ICSSE), Dong Hoi, Vietnam, 2019, pp. 335-340, doi: 10.1109/ICSSE.2019.8823432

[3] M. Dholu and K. A. Ghodinde, "Internet of Things (IoT) For Precision Agriculture Application," 2018 2nd International Conference On Trends In Electronics and Informatics (Icoei), Tirunelveli, 2018, Pp. 339-342, Doi: 10.1109/Icoei.2018.8553720.

[4] O. Elijah, T. A. Rahman, I. Orikumhi, C. Y. Leow and M. N. Hindia, "An Overview of Internet of Things (IoT) and Data Analytics in Agriculture: Benefits and Challenges," in IEEE Internet of Things Journal, vol. 5, no. 5, pp. 3758-3773, Oct. 2018, doi: 10.1109/JIOT.2018.2844296.

[5] M. Carlos-Mancilla, E. López-Mellado, M. Siller, "Wireless Sensor Networks Formation: Approaches and Techniques," Journal Of Sensors, Vol. 2016, Mar 2016. [Online]. Accessed On: July 17, 2020. Available: https://www.hindawi.com/journals/js/2016/2081902/

[6] Documentation | MQTT. [Online]. Accessed On: July 16, 2020. Available: http://mqtt.org/documentation

[7] ThingSpeak Documentation. [Online]. Accessed On: July 17, 2020. Available: https://www.mathworks.com/help/thingspeak/

This page is kept blank intentionally

Development of RESPO-Portable Testing Kit for Respiratory Diseases

Ankit Singh
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
singhankit1776@gmail.com

Swapnil Thorave
Electronics Department
Thakur College of Engineering and Technology
Kandivali (East),
Mumbai - 400 101
swapnilthorave1513@gmail.com

Sushant Tiwari
ElectronicsDepartment
Thakur College of Engineering and Technology
Kandivali (East)
Mumbai - 400 101
sushanttiwari1357@gmail.com

***Abstract*—At present the diseases spreading through air medium are increasing day by day. This kind of disease directly affect the respiratory system of human body. To detect their symptoms every time we need to do different and multiple tests which is very costly. And for the patients who are under observation doctors need to check the symptoms every time. It can identify and take necessary precautions for the disease to stop spreading to other people. This project offers a low-cost solution which will help us to detect the symptoms of the respiratory diseases.This device will consist of sensors to detect symptoms like temperature, oxygen level, heart beat rate of a person who is under suspicion of having contracted air-borne diseases.Most people get discouraged to get tested because of high cost until they are at terminal stage of the disease. In rural areas where there is shortage of hospital staff and amenities and Doctors are not able to pay attention to every patient, this project can help them prioritize their attention where it is most needed. There will be less human intervention in the detection process and it can be used without any prior experience in medical field.**

Keywords—Internet of Things (IOT), Sensors, Monitoring, Portable, Data Backup, Database, Machine Learning

I. INTRODUCTION

At present the diseases spreading through air medium are increasing day by day. This kind of disease directly affect the respiratory system of human body. To detect their symptoms every time we need to do different and multiple tests which is very costly. And for the patients who are under observation doctors need to check the symptoms every time. To check the symptoms of each disease there is a separate test for each which makes it time-consuming and costly.Monitoring of patient's health is very hectic and handling of database becomes more tedious job[2]. We can identify and take necessary precautions for the disease to stop spreading to other people. The equipment used are very large and bulky and also the installation cost in high. The timely and accurate diagnosis of respiratory virus infections has the potential to optimize downstream use of limited health care resources, including antibiotics, antivirals, ancillary testing, and inpatient and emergency department beds.Most people get discouraged to get tested because of high cost until they are at terminal stage of the disease. Current situation of the pandemic around the world calls for the need of machines and device which detect and predict the specific diseases from getting transmitted.

II. PROPOSED FRAMEWORK

The following set of Sensors/Actuators which are used in the system design are listed asfollows:

1. Arduino UNO
2. ESP-01 Wi-Fi module
3. Bluetooth HC-05
4. MAX30205 Temperature Module
5. Grove - Finger-clip Heart Rate Sensor
6. SEN-11574 Pulse Rate Sensor

A. The board used for project is Arduino UNO. This microcontroller 20 digital input/output pins, a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header.

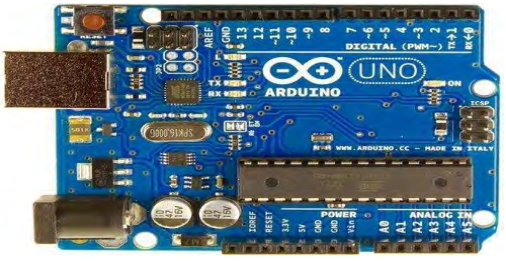


Fig.1.Arduino UNO board

B. ESP-01 Wi-Fi module used to provide the network connection abilities. It allows microcontroller to access Wi-Fi network.

Fig.2.ESP-01 Module

C. It manages the communication channel of the wireless part. It can transmit and receive the data wirelessly.

Fig.3.Bluetooth HC-05 Module

D. To detect the body temperature of the person we use MAX30205 Human Body Temperature Sensor Module

Fig.4 MAX30205Temperature Sensor

E. To detect the heart rate of body, Grove Fingerclip Heart Rate Sensor is used.

Fig.5.GroveFingerclip Heart Rate Sensor

F. It is used for incorporating pulse-rate data of the person.

Fig.6.SEN-11574 Pulse Rate Sensor

Following software components are used:

1. Google Colab
2. MIT App Inventor
3. SQL

A. Google Colab

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
import numpy as np
import pandas as pd
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import train_test_split
```

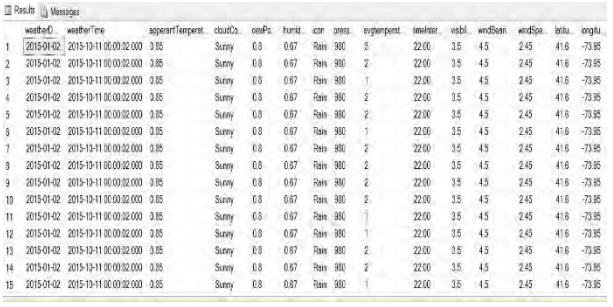
```
file_path = '/content/drive/My Drive/BE PROJECT/dataset.csv'
df = pd.read_csv(file_path)
print(df)
```

```
      Breathing Problem  Fever (37-39.5)  ...  Fatigue   COVID-19
0                     1                1  ...        1         1
1                     1                1  ...        1         1
2                     1                1  ...        1         1
3                     1                1  ...        0         1
4                     1                1  ...        0         1
...                 ...              ...  ...      ...       ...
5429                  1                1  ...        1         1
5430                  1                1  ...        1         1
5431                  1                1  ...        0         0
5432                  1                1  ...        0         0
5433                  1                1  ...        1         0

[5434 rows x 13 columns]
```

Fig.7. Google Colab

B. SQL



Results | Messages

	weatherID	weatherTime	apparentTemperat...	cloudCo...	dewPo...	humid...	icon	press...	sysbarometer...	timeMeter...	visbl...	windBearin...	windSpe...	lotitu...	longitu...
1	2015-01-02	2015-10-11 00:00:02.000	0.85	Sunny	0.8	0.67	Rain	980	3	22.00	3.5	4.5	2.45	41.6	-73.85
2	2015-01-02	2015-10-11 00:00:02.000	0.85	Sunny	0.8	0.67	Rain	980	2	22.00	3.5	4.5	2.45	41.6	-73.85
3	2015-01-02	2015-10-11 00:00:02.000	0.85	Sunny	0.8	0.67	Rain	980	1	22.00	3.5	4.5	2.45	41.6	-73.85
4	2015-01-02	2015-10-11 00:00:02.000	0.85	Sunny	0.8	0.67	Rain	980	2	22.00	3.5	4.5	2.45	41.6	-73.85
5	2015-01-02	2015-10-11 00:00:02.000	0.85	Sunny	0.8	0.67	Rain	980	2	22.00	3.5	4.5	2.45	41.6	-73.85
6	2015-01-02	2015-10-11 00:00:02.000	0.85	Sunny	0.8	0.67	Rain	980	1	22.00	3.5	4.5	2.45	41.6	-73.85
7	2015-01-02	2015-10-11 00:00:02.000	0.85	Sunny	0.8	0.67	Rain	980	2	22.00	3.5	4.5	2.45	41.6	-73.85
8	2015-01-02	2015-10-11 00:00:02.000	0.85	Sunny	0.8	0.67	Rain	980	2	22.00	3.5	4.5	2.45	41.6	-73.85
9	2015-01-02	2015-10-11 00:00:02.000	0.85	Sunny	0.8	0.67	Rain	980	2	22.00	3.5	4.5	2.45	41.6	-73.85
10	2015-01-02	2015-10-11 00:00:02.000	0.85	Sunny	0.8	0.67	Rain	980	2	22.00	3.5	4.5	2.45	41.6	-73.85
11	2015-01-02	2015-10-11 00:00:02.000	0.85	Sunny	0.8	0.67	Rain	980	1	22.00	3.5	4.5	2.45	41.6	-73.85
12	2015-01-02	2015-10-11 00:00:02.000	0.85	Sunny	0.8	0.67	Rain	980	1	22.00	3.5	4.5	2.45	41.6	-73.85
13	2015-01-02	2015-10-11 00:00:02.000	0.85	Sunny	0.8	0.67	Rain	980	2	22.00	3.5	4.5	2.45	41.6	-73.85
14	2015-01-02	2015-10-11 00:00:02.000	0.85	Sunny	0.8	0.67	Rain	980	2	22.00	3.5	4.5	2.45	41.6	-73.85
15	2015-01-02	2015-10-11 00:00:02.000	0.85	Sunny	0.8	0.67	Rain	980	1	22.00	3.5	4.5	2.45	41.6	-73.85

Fig.8. SQL database

III. PROPOSED ARCHITECTURE &METHODOLOGY

This device will detect multiple number of respiratory diseases. It is a portable device, therefore there is no the large-scale installation cost. This device will check the symptoms and send the data to the database, using Bluetooth technology. A threshold or level will be set for our measuring parameters above which the device will directly call the doctor, as it will be considered as an urgent situation.Doctorswill be getting alerts as the parameters are crossing their threshold.Temperature, Respiration Rate, Blood Oxygen Separation will be measured using different sensors[8].Using the data stored in database regarding each individual patient.This device will also apply machine learning so that we can predict the early onset of the disease in the patient's body and measures can be taken to prevent it. It will be a portable device which can be worn on arm[5]

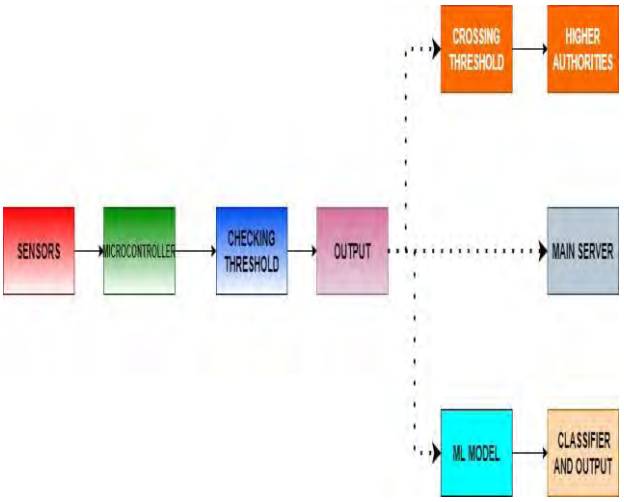


Fig.9. Block Diagram of the system

1. The Input consists of sensors which are designed to sense the body temperature, Heart-rate, Pulse-rate, respiration rate [8].
2. All those 4 sensors are interfaced with Arduino UNO and ESP-01 Module [1].
3. The Arduino UNO is given power either from a Laptop or an external power supply.
4. The Microcontroller Board acts as a bridge between input and output.
5. The data will be sent to database using Bluetooth Technology.
6. Whenever the threshold is crossed it will send the data to the Higher Authorities notifying them that the patient needs the urgent care.
7. ML Model will be responsible for training and evaluating database to predict the onset of disease.
8. App will be used to monitor patient's Health Data

IV. LITERATURESURVEY

- Device can be contact or non-contact based, contact based method relies on devices attached to the subject body.
- The device will be capable of monitoring multiple parameters such as PPG (photoplethysmography), ECG (electrocardiography), pulse rate and heart rate can be extracted respectively.[2]
- Wearable sensor system consists of a wristband and chest patch which gives the relation of individual environmental exposure which helps one to understand the impacts of ozone or chronic asthma conditions. The hardware that we are going to implement should occupy less space. This will make it more reliable to use. These sensors generally consumes less power.[8]
- Pulse oximetry is used to monitor the health of seriously ill-patients over long periods, it is useful to develop light weight POM sensor whichas a system can be easily worn. [4]
- The sensor is connected with SpO2 system mounted on printing circuit board. It sensesPPGsignal. Software on PC can record wireless PPG signals of patients to calculate SpO2 and heartbeat rate.[6]

V. DESIGNINGMODEL

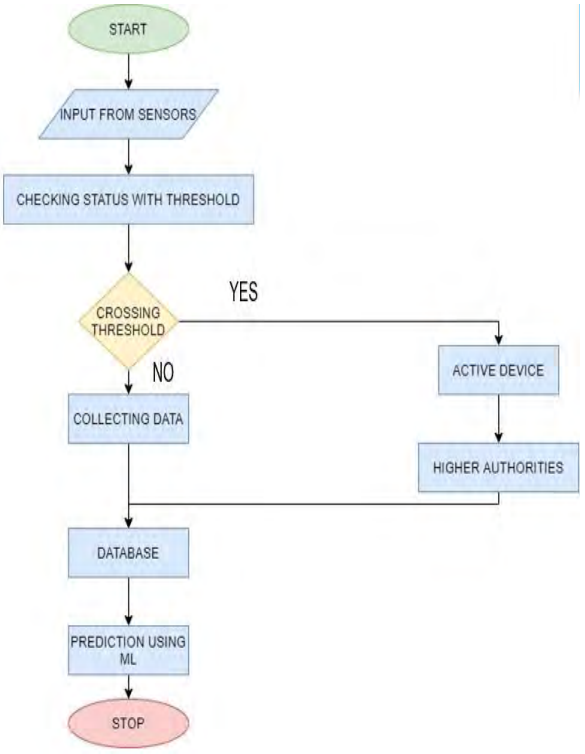


Fig.10.Flowchart of the System

[1] *Sensing the parameters*
This process involves making use of sensors as a sensing element to sense different parameters.MAX30205 will detect body temperature. Grove finger Clip sensor is used to detect heart-rate.SEN-11574 is used to detect pulse-rate.[1]

[2] *Checking the threshold of the parameters*
Doctors will be getting alerts as the parameters are crossing their threshold. Alerts and notifications will be sent to doctors.

[3] *Transmitting the data to the main server*
Sending the data from the microcontroller to the main server using Bluetooth.

[4] *Machine Learning Model*
For predicting the early onset of diseases, data will be put through an ML model and classifier.

[5] *Display of Data*
The Data will be stored database as well as it will be displayed on an app. App will have real-time monitoring.

VI. Applications

A. Medical Facilities and Hospitals

This device can be used at Hospitals and Medical Facilities where there is shortage of Doctors and Hospital Staff. As this is a low-cost device it has application in rural areas where there are hospitals that cannot afford the cost of large-scale equipment.

B. Quarantine Facilities

Device can be interfaced with GPS and Geofence in Quarantine facilities. This can be used as monitoring and surveillance system to prevent people from escaping

C. Early Warning System

Wearables acts as an indicator for change in a person's health. In this perspective, a wearable patch tracking a person's breathing parameters or blood oxygen saturation, could be one of the building blocks of a strategy towards dealing with future pandemics.

VII. Results

This project will be portable thereby reducing large installation costs. It will also encourage home-testing. Ensures healthy lives and promote well-being for all at all ages is one of the most important goals and needs to receive special attention by governments.

VIII. FutureScope

This project is aimed at overcoming the drawbacks of other systems currently available in market, devices that are costly, uncomfortable, difficult-to-install,.Doctor will be getting alerts as the parameters are crossing their threshold. There is no need for the doctors to stay in constant contact with the patient thereby decreasing their chances of not getting infected. This project will simplify the process of detection of diseases.

Acknowledgment

This project cannot be entirely created by an individual. The timely completion of the project 'Development of RESPO-Portable testing kit for Respiratory diseases' has been possible because of our teacher and project guide Mr. Hemant Kasturiwale who provided us with guidance and motivation throughout its making. We thank him for giving us an opportunity to create this project.We are also thankful to Dr. S.C. Patil (Electronics Department, HOD) for his guidance and to our parents for providing all possible resources to gain the best possible knowledge.Finally, we would thank our college 'Thakur College of Engineering and Technology' for providing us with a platform and the necessary facilities to make this project.

References

[1] S. S. Thomas, A. Saraswat, A. Shashwat and V. Bharti, "Sensing heart beat and body temperature digitally using Arduino," 2016 International Conference on Signal Processing, Communication, Power and Embedded System (SCOPES), Paralakhemundi, 2016, pp. 1721-1724, doi: 10.1109/SCOPES.2016.7955737.

[2] L. Fang et al., "Multi-parameter health monitoring watch," 2017 IEEE 19th International Conference on e-Health Networking, Applications and Services (Healthcom), Dalian, 2017, pp. 1-6, doi: 10.1109/HealthCom.2017.8210807.

[3] Soubelet A., Pathinarupothi R.K., Rangan E.S., Kripesh, Durga P., Menon K.A.U. (2020) Internet-of-Things Based Respiratory Rate Monitoring for Early Detection of Cardiovascular and Pulmonary Diseases. In: Inácio P., Duarte A., Fazendeiro P., Pombo N. (eds) 5th EAI International Conference on IoT Technologies for HealthCare. HealthyIoT 2018. EAI/Springer Innovations in Communication and Computing. Springer, Cham. https://doi.org/10.1007/978-3-030-30335-8_8

[4] R. M. AILENI, S. PAȘCA and A. FLORESCU, "E-Health Monitoring by Smart Pulse Oximeter Systems Integrated in SDU," 2019 11th International Symposium on Advanced Topics in Electrical Engineering (ATEE), Bucharest, Romania, 2019, pp. 1-4, doi: 10.1109/ATEE.2019.8724865.

[5] D. Lee, O. R. Choi and Y. Seo, "A Handheld and Battery-Powered Realtime Microfluidic Polymerase Chain Reaction (PCR) Amplification Device," 2019 20th International Conference on Solid-State Sensors, Actuators and Microsystems &Eurosensors XXXIII (TRANSDUCERS & EUROSENSORS XXXIII), Berlin, Germany, 2019, pp. 1063-1066, doi: 10.1109/TRANSDUCERS.2019.8808729.

[6] A. Azhari et al., "A patch-type wireless forehead pulse oximeter for SpO2 measurement," 2017 IEEE Biomedical Circuits and Systems Conference (BioCAS), Turin, 2017, pp. 1-4, doi: 10.1109/BIOCAS.2017.8325557.

[7] T. Elfaramawy, C. L. Fall, S. Arab, M. Morissette, F. Lellouche and B. Gosselin, "A Wireless Respiratory Monitoring System Using a Wearable Patch Sensor Network," in IEEE Sensors Journal, vol. 19, no. 2, pp. 650-657, 15 Jan.15, 2019, doi: 10.1109/JSEN.2018.2877617.

[8] J. P. Dieffenderfer et al., "Wearable wireless sensors for chronic respiratory disease monitoring," 2015 IEEE 12th International Conference on Wearable and Implantable Body Sensor Networks (BSN), Cambridge, MA, 2015, pp. 1-6, doi: 10.1109/BSN.2015.7299411.

Autonomous Water Surface Garbage Collector

Ritik Chaurasiya
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
chaurasiyaritik50@gmail.com

Mukesh Choudhary
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
mkchoudhary7767@gmail.com

Aditya More
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
adityamore8100@gmail.com

***Abstract*— The problem of water logging due to plastic, Floating trash on surfaces, thermocole and metal leads to pest growth and it favors diseases like malaria, typhoid etc. This is unsafe for marine life and human life as well and hence the idea of this project emerged. This proposed system is to minimize or overcome the problem faced while manually cleaning which is inefficient and to minimize the increased dumping rate of waste in water. The design of an autonomous ship for cleaning the garbage floating on a lake has been proposed. The ship is powered by a solar battery. Ultrasonic sensors have been equipped to detect the distance between the ship and the bank of the lake. The ship has also been equipped with a system to detect the occurrence of obstacles and to bypass the detected obstacles. Two screw propellers have been installed at the two sides of the ship to drive the ship, which makes the ship change its direction nimbly. This study features a proposed plan of garbage gathering system viable and effective for tidying up waste from rivers, channels and lakes. The integrated Training Model has the ability to monitor and control the entire process.**

Keywords—Garbage collector, Computer vision, autonomous ship, Transfer Learning, MobileNet.

I. INTRODUCTION

In today's developing era there is a lot of advancement in technology and many other things but along with this there is a lot of increase in pollution it is on land, water and air. Due to increase of pollution a lot of species are affected and to do decrease pollution there are lot of campaigns and decision are undertaken to maintain the cleanliness. Water waste is being collected manually by workers through scoope net but there is a requirement in advancement of collecting water garbage waste for better efficiency and reducing cost and this can be achieved by using an autonomous system for collecting surface water garbage waste by object detection which help to improve the functionality.

Lots of floating water garbage exists in every river especially in Major cities like Mumbai. It is cleaned by traditional method manually using nets to collect the garbage and dispose it. That method takes a lot of time and efforts and also it is not efficient too. Since dumping of garbage is increasing day by day, manual method is not enough to clean and takes a toll on personal hygiene of workers. To overcome this we introduced the proposed model.

II. PROPOSED FRAMEWORK

The following set of Sensors/Actuators which are used in the system design are listed as follows:

1. Raspberry Pi-4
2. Pi Camera
3. PVC Pipes
4. Battery
5. Motor
6. Software
7. Propellers

1)Raspberry-Pi-4:It is a high-performance 64-bit quad-core processor, dual-display support at resolutions up to 4K via a pair of micro-HDMI ports, hardware video decode at up to 4Kp60, up to 4GB of RAM, dual-band 2.4/5.0 GHz wireless LAN, Bluetooth 5.0, Gigabit Ethernet, USB 3.0.

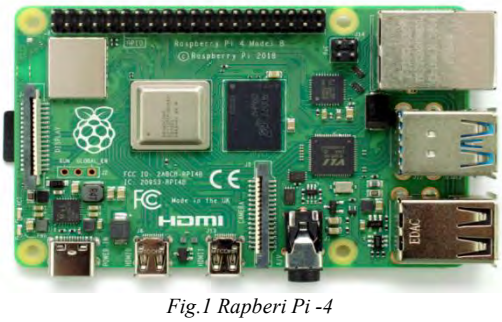


Fig.1 Rapberi Pi -4

2)Pi Camera: module is a portable light weight camera that supports Raspberry Pi. It communicates with Pi using the MIPI camera serial interface protocol. It is normally used in image processing, machine learning or in surveillance projects.

Fig.2 Pi Camera

3) PVC PIPE: It is a tubular section, or hollow cylinder, made of plastic. It is usually, but not necessarily, of circular cross-section, used mainly to convey substances or for structural applications.

Fig.3. pvc pipe

4)Battery: is an important key factor of mobility for the autonomous water surface garbage collector battery is used will be li ion because the SOC and overall safety is to high furthermore it is rechargeable and easy to intsall and to monitor the battery performance battery management system will be used so to keep the small battery pack safe battery has a voltage of 12v and 7.2Ah.

Fig.4.Battery

5) Motor: It is an important part of any mobile device without which instrument can not move from point A to point B.We are using A D.C Motor for moving one place to other and for controlling a Motor we are using Motor controller who controlled the motor like speed of motor and direction of motor will be controlled by Motor Controller.

Fig.5. Motor

5)Software: For software part there is an integration three to 4 thing. Our primary programming language is used is python and for computer vision the method is used is transfer learning. Because of this it is easy to train the model for the custom object detection due to is preloaded weights which cut short the training time. Model architecture is mobile net and activation function is softmax.

6)Propellers: Propellers are used in the system at end to give the mobility of autonomous water garbage collector the propellers are connected to the motor for movement purpose.

Fig.6. propellers

III. PROPOSED ARCHITECTURE & METHODOLOGY

The above Block Diagram works as first the ultrasonic sensor will detect the object once the object is detected then it sends signal to raspberry pi and raspberry pi gives further signal to pi camera and pi camera capture the image and then it sends back to the training model via raspberry pi and once it is send to the training model and it is checked whether it is garbage or not once it is done then via GPIO pins of raspberry pi to the propellers and it is powered by battery and the bot goes and collect it. The software architecture used is a mobile net architecture which is a transfer learning method used in deep learning because of transfer learning and the added weights it is easy to train a model with a very

good accuracy the accuracy which is obtained is above 90 percentage. Since mobile net architecture can detect upto 1000 class. But in these case the class are limited to only 5 which are plastic, cardboard, fishing net, metal and glass. Since transfer learning model are data hungry the preparation of data is necessary data was prepared by available free google images. To tackle the problem of limited data a technique data augmentation is used.

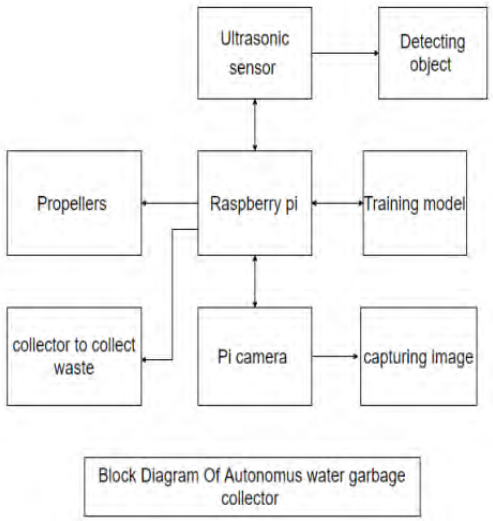
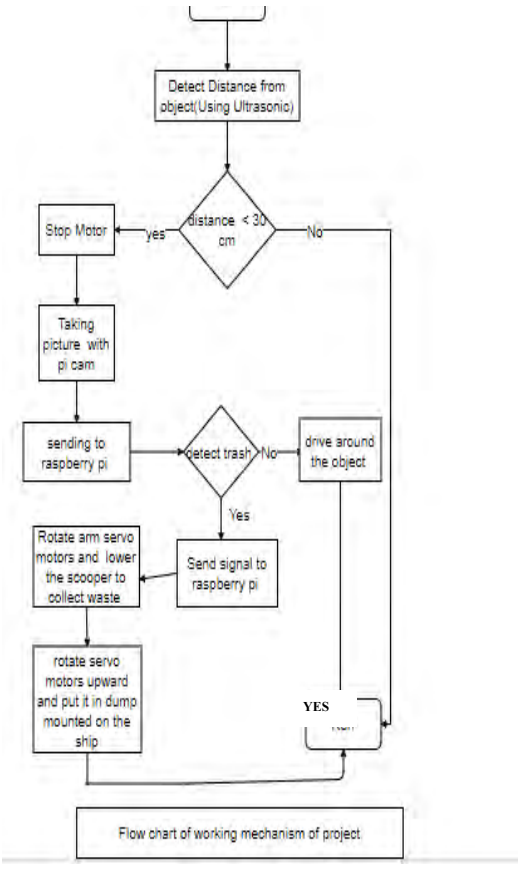


Fig.7. Block Diagram

IV. FLOWCHART



V. RESULT

The Autonomous Garbage Collector is very well performing in detecting the garbage on water surface and also the collection of garbage is very smooth process for the collector and once the garbage bag is reached to its limit the autonomous water garbage collector brings the garbage to the shore.

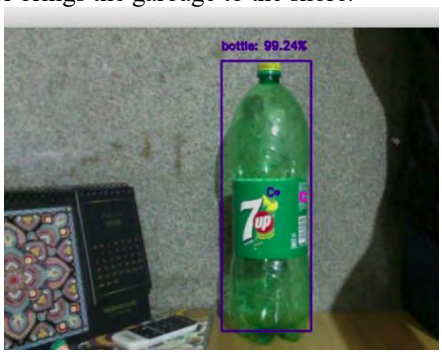


Fig.8 Output

VI. FUTURE SCOPE

Our system is a stepping stone for a more advanced cleaning system of garbage floating on water.
Aquatic life can get enough sunlight.
Maintain hygiene of people who do this work manually and it also saves time.

VII. CONCLUSION

Overall the machine is performing under some circumstances there is slightly a false prediction which can be solved the increasing the amount of balanced data.

ACKNOWLEDGMENT

We would like to express my special thanks of gratitude to our project guide Mrs. Jalpa Pandya who gave us the golden opportunity to do this wonderful project on the topic “Autonomous Surface Water Garbage Collector ”, which also helped us in doing a lot of research and exploring more. We are also thankful to Dr. S.C.Patil (Electronics Department, HOD) for her guidance and to our parents for providing all possible resources to gain the best possible knowledge. Finally, we would thank our college ‘Thakur College of Engineering and Technology’ for providing us with a platform and the necessary facilities to make this project.

REFERENCES

[1] A. Sinha, P. Bhardwaj, B. Vaibhav, and N. Mohammad, “Research and Development of Ro-Boat – An Autonomous River Cleaning Robot,” in Intelligent Robots and Computer Vision XXXI: Algorithms and Techniques, 2014, vol. 9025, pp. 1–8.

[2] S. S. Rafique and A. Langde, “Design And Fabrication Of River Cleaning Machine,” Int. J. Sci. Res. Dev., vol. 3, no. 11, pp. 8–18, 2017.

[3] Ganesh U L and Vinod V Rampur” Semi-Automatic Drain For Sewage Water Treatment Of Floating Materials” International Journal of Research in Engineering and Technology, 2016, vol.5,7, pp.1-4

[4] M. N. Mohammed1*, S. Al-Zubaidi 2, Siti Humairah Kamarul Bahrain1, M. Zaenudin3, MuhammadIrsyad Abdullah, “Design and Development of River Cleaning

Robot Using IoT Technology" 16th IEEE International Colloquium, 2019, vol.2, pp.84-87

[5] Ketan H. Pakhmode, Ronit R. Dudhe, Gangadhar S. Waghmare, Daniyal A. Kamble, Kirti Dhenge "Solar powered water surface garbage collecting boat" International Research Journal of Engineering and Technology (IRJET), 2019, vol 6, e-ISSN: 2395-0056, pp.3223-3225

Alarm System for Underground Optic Fibre Cable

Harsh Yadav
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
r.axe703@gmail.com

Ankush Yadav
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
ankushyadav212@gmail.com

Antim Yadav
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
antimhr@gmail.com

***Abstract*—This fault detecting system is used find the fault in the optical fiber line across the customer sides. The received power supply microcontroller. The microcontroller is operated in low power mode to save power consumption. Exact location of the fault occurred in the optical fiber line**

Keywords—Internet Of Things (IOT), fault detection, IoT, alarm system

I. Introduction

Fiber optics communication is developed immensely in the past two decades. It is seen much lower interference and attenuation in optical fibers compared to copper wires. The fiber is a strand of silica based glass protected with a transparent cladding. The information is transmitted through the fiber in the form of monochrome light over great distances at a high data rates. Now days Telecommunication companies are phasing problem related to connection due to optic fibre. By using an alarm system will help to detect exact fault place. So problem can be solve within time.

II. Literature Survey

There are many related studies based on optical fiber fault detection. This paper is about Introduced Underground Cable fault detecting system using Arduino. This research is based to identify the distance of underground cable fault from base station in kilometers using Arduino board.

This greatly reduces the time and operates effectively. In this it is possible to detect the location of open circuit fault. Location of the fault is detected from the server unit.

The information is transmitted through the fiber in the form of monochrome light over great distances at a high data rates. Now days Telecommunication companies are phasing problem related to connection due to optic fibre. By using an alarm system will help to detect exact fault place. So problem can be solve within time

III. Research Gaps

Fiber optics communication is developed immensely in the past two decades. It is seen much lower interference and attenuation in optical fibers compared to copper wires. The fiber is a strand of silica based glass protected with a transparent cladding. The information is transmitted through the fiber in the form of monochrome light over great distances at a high data rates. Now days Telecommunication companies are phasing problem related to connection due to optic fibre. By using an alarm system will help to detect exact fault place. So problem can be solve within time.

IV. Problem Definition

All optical fiber cables are sensitive to damage during shipping, handling, and installation. Some of the important parameters that need special attention during cable installation are

Cable bending radius: Optical fiber cables are designed with a minimum bending radius and maximum tensile strength. The cable should never be bent below its minimum bending radius. Doing so can result in bending losses and/or breaks in the cable's fibers. Generally the minimum bending radius of a fiber cable under load is 20 × D, where D is the diameter of cable; the minimum bending radius of a fiber cable under no load is 15 × D.

Cable Placing Tension: Optical fiber cables are designed with a maximum tensile strength. The cable should never be loaded beyond its maximum tensile strength. Exceeding the cable's placing tension provided by Sterlite in the Cable Data Sheet/Specification, can alter cable and fiber performance and shorten its service lifetime.

V. Proposed Methodology

Optical fiber fault recognition and adaptation involves of two stages: I) Fault Recognition Phase and II) Fault Adaptation Phase.The method of error recognition and adaption involves of two stages:

I) Fault Recognition Stage:

This stage is to pinpoint the place where optical fiber cable has been cut due to some reason like structure of

road. The device which is recycled for this is called Optical Time Domain Reflectometer.

II) Fault Adaptation Phase:

This stage is to make OFC joint with slight spice damage. The device used for linking is called mixture splicer. To understand this concept considers a example. Adopt there are two telephone connections A and B which are located at a distance of D from each other. Both the telephone connections are connected through 0ptical fiber cable. Due to some reason the Optical fiber cable which link A and B is cut. After the Optical fiber cable breakdowns between A &B, the optical fiber diffusion equipment‘s installed at A&B start exhibiting visual alarms. After observing the visual alarms it is supposed that the OFC break between A’&B’. To prove this statement or to know the real place of Optical fiber cable break, OpticalTime Domain Reflectometer is connected to fiber at A or B or both and the distance of fiber is measured.

There can be only two possibilities

The distance of fiber (Y) = D which suggest there is no Optical fiber cable break.

The distance of fiber (Y) < D which suggest optical fiber cable broke has been broken.

When the distance of fiber Y is recognized this is a lesser amount of than D because the Optical fiber cable has been cracked. Currently to repair the Optical fiber fault breakdown, the distance X is equal to Y from A is slow along the Optical fiber cable way on the road through space meter or any car.

Two digs are made on both the sides once the optical fiber cable reaches Distance X, at distance of 1020 meters. The length between crack and the cut should not be big if so it is hard to detect fault.

It is to pull breakdown cable from both the sides once after making two digs. The digs and placed a new cable between both the digs.

Both the trimmings of the original cable are connected with the cracked ends of old cable.

BLOCK DIAGRAM:

The device which is used to make optical fiber cable joint is called mixture splicer or splicing mechanism. The optical fiber cable joints are cover by mutual shutting box. Then the combined shutting boxes are located below the digs and digs are occupied with earth. The communication between A and B starts again as the Optical fiber cable. Error is corrected. Currently the space between A and B = D + the length of the new fibre.

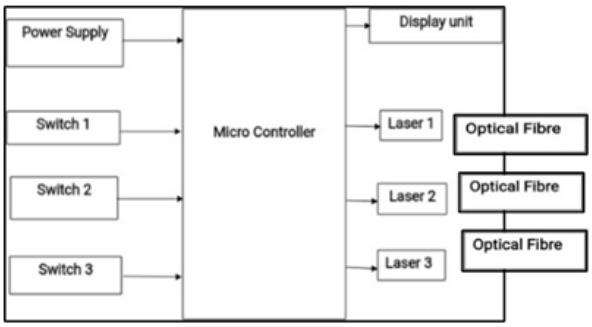


Fig.1. visual representation of block diagram. 1

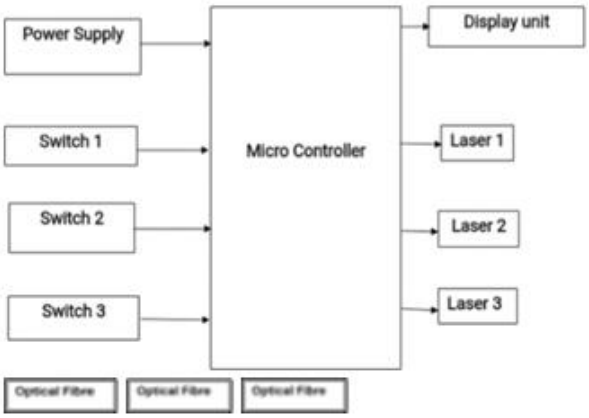


Fig.2. visual representation of block diagram. 2

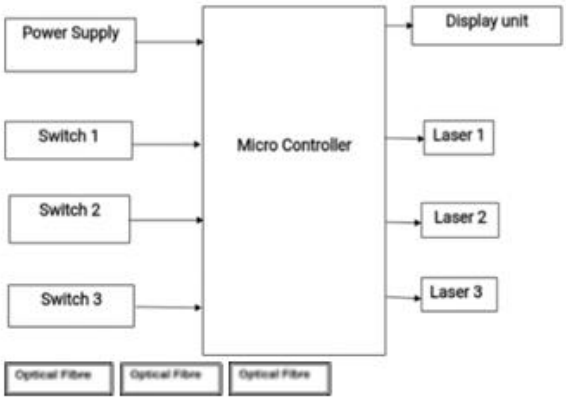


Fig.3. visual representation of block diagram. 3

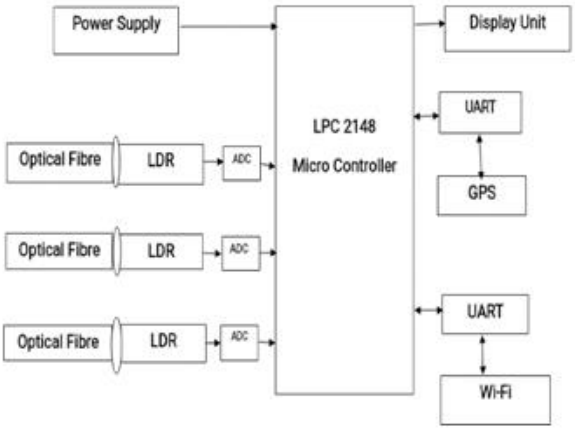


Fig.4. visual representation of transmission unit.

Transmission unit

In transmission unit switches are connected as line 1, line 2, and line 3. Adapter is used to activate PIC16F877A microcontroller and hence switches, laser, LCD gets activated through Microcontroller.

LCD displays the title of project. Laser transmits monochromatic light in order to transmit data to optical fiber. Optical fiber carries light signals.

2. Receiver unit

In receiver unit adapter is used to activate LPC2148 Microcontroller and hence optical fiber, LDR sensor, ADC gets activated through microcontroller. Optical fiber is given as input to another Microcontroller unit. Optical fiber is connected to LDR sensor. LDR sensor is connected to analog digital converter. LCD connected displays the fault occurred.

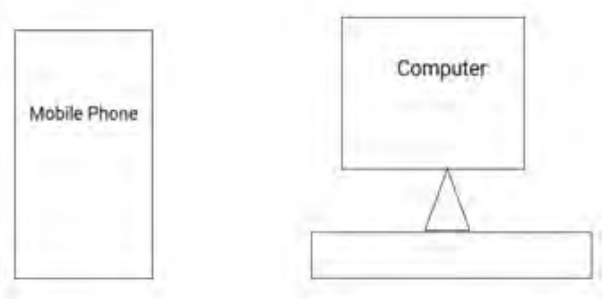


Fig.5. visual representation of experimental unit

3. Serverunit

In server unit if fault occurs in Line 1, Line 2, Line 3. GPS determines the exact location and this message are automatically sent to mobile phone and laptop through app. The actual problem of detecting faults and find where the actual fault has occurred by finding the exact position or locations in latitude longitude form and also find the accurate distance of breaker points. By using software's can encrypt the land transfer at controlling section and actual action will be working out.

The device which is used to make optical fiber cable joint is called mixture splicer or splicing mechanism. The optical fiber cable joints are cover by mutual shutting box. Then the combined shutting boxes are locatedbelow the digs and digs are occupied with earth. The communication between A and B starts again as the Optical fiber cable. Error is corrected. Currently the space between A and B = D + the length of the new fibre.

VI. Conclusion

From this project it is possible to simplify the actual problem of detecting faults and find where the actual fault has occurred by finding the exact position or locations in latitude longitude form and also find the accurate distance of breaker points. By using software's can encrypt the land transfer at controlling section and actual action will be working out.

References

[1] IoT Based Underground Optical Fiber Cable Fault Detection System

[2] Murugesh PD ,Damini R ,Amitha P ,Shwetha M Assistant Professor,UG scholar, Dept.of EEE, Sri Venkateshwara College of Engineering, Bengaluru, India

[3] https://www.stl.tech/connectivity-solution/optical-fibre-cable/pdf/Underground_Installation_of_Optic_Fiber_Cable_Placing-_New-_Final.pdf

This page is kept blank intentionally

Iot Based Biometric Implementation on Raspberry Pi

Yashvardhan Dwivedi
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East), Mumbai - 400 101
yashvardhan.dwivedi@gmail.com

Vinay Chaurasiya
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East), Mumbai – 40101
vinaychaurasiya2000@gmail.com

Indroneel Das
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East), Mumbai - 400 101
indroneel.k.das@gmail.com

Vikas Gupta
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East), Mumbai - 400 101
vikasgupta@gmail.com

***Abstract*— In today's world, authentication is taking new shifts as security becomes complex and an addressable issue. We have proposed an easier method for monitoring workforce and provides high end security to the authorities. It uses IoT and cloud computing technologies. Combining various modules available in RPi, we can implement a realistic cloud based authenticator.**

Keywords—IoT, Biometrics, Cloud Computing, Security

I. Introduction

In the developing country like India, security of information is required and it is must, for security Authentication acts an imperative role in internet security. And it can be done using biometric.
Biometric is the best method for secure the information and we can improve by adding extra features (i.e. biometric matching, like eye, finger ,face scan) in advance level but it require a computer system, so we can use Raspberry Pi it is a micro-computer system with boundless abilities similar to PC. Raspberry Pi is given a new direction in (IOT) internet-of-things applications. By utilizing biometric technology, a novel system of IoT based biometrics was proposed. The encrypted biometric information is stored on the cloud and the authentication is created through Biometric service as host on cloud. It can be use in many applications like transport, health care, information security etc.

II. Literature Survey

We have referred 3 papers based on the domain of our project. The first paper talks about the vividness of the IoT technology and the protocols that are present. There are various standards followed for various applications which are driven by the project themselves.
The Second paper talks about the integration of the Cloud and the IoT devices using various modules available. Importing of various packages like AES-26 for security and APIs like libsub and LibScan which help devices like RPi to function on client -to-server-to-client methodology. The fact that various open source modules are freely available specifically for the security protocols highlights the feasibility of the project.
The third paper talks about a project already in place with a similar architecture. It uses Zigbee module that is a small range transmitter-receiver module. The "Dot Dot" idea proposed by Zigbee was designed for small range application such as on doors or windows, as seen in this paper.

III. Research Gaps

The current systems that are in place have been quite robust when it comes to their applications. But as in current scenario, physical presence is of less preference when it comes to authentication. Thus, a system where user may not need to be present but can directly log into the premises over through cloud can become a great potential. This is the gap that needs to be filled. Also, as fingerprint recognition may be of less preference today, thus non-contact-based biometrics need to be implemented. Thus a device with all necessary parameters and which is also future ready with respect to cloud based technologies.

IV. Problem Definition

In the developing country like India, security of information is required and it is must, for security Authentication acts an imperative role in internet security. And it can be done using biometrics.
Biometric is the best method for secure the information and we can improve by adding extra features (i.e. biometric matching, like eye, finger, face scan). By utilizing biometric technology, a novel system of Iot based biometrics can be proposed.
Our proposed plan deals with the inadequate management and poor security present in an organization's infrastructure. With our system, the specific target is integrated with IoT and uses biometrics for security. It will be able to control the number of transactions made in a day and also control the objects actions when authorized.
Our main goal is size and cost which can be adjusted depending on the requirements.
Our future plans for such a system is to make it

wireless medium.

V. Proposed Methodology

Block Diagram:
We can see the block diagram of our project which describes about the device. It informs about the terminologies used in the project and further how it is actually implemented in the device. The various protocols and the steps performed are also given by the block diagram

Fig. 1. Block Diagram

Implementation:
Following is the method of implementation of the project:
• First, the finger print of the users should be stored in the server to recognize the user. You can program the system in such a way that ' YES er you press 'E' the enrolment action will be activated. And then the finger print of any user can be stored.
• During the authentication or attendance process, you can press the 'ST' button to start the process. A green LED glows and indicates the status of the system. Then the handheld device can used for the authentication purpose.
• And once the authentication process is done you can press 'SP' button to stop the process and the green LED will stop glowing.
• The finger print modules is connected to Arduino and the serial communication is done through the ZigBee module, which establishes the connection with Raspberry Pi
• Once the authentication or attendance system process is over, the data will be uploaded to the cloud server for storage and analysis purposes.

Algorithm:
The Algorithm followed for the implementation of the project can be seen below:

Fig. 2. A general Algorithm

VI. Expected outcome

The Expected functioning of the device is when a user will get successfully authenticated. The user will register his/her biometrics on the device and a successful call from the device represented by a green signal will enable user to access the threshold where the device is used

VII. Conclusion

The project is very basic when it comes to the real-world applications but poses a wide range of possibilities and flexibilities which can be done to further enhance its scope. This project is supposed for a realization of a Cloud based Authenticator which can be used in wide array of environments. Thus, the project poses as a blueprint for the further versions for cloud based authenticators. This project will further improvise the security aspects of access points for wide variety of clients.

Acknowledgment

A sincere gratitude to our mentor Mrs. Leena Chakraborty for the guidance provided, the team members who contributed and the platform that was provided to us which enabled us to begin the project. We sincerely acknowledge all the personals involved throughout our journey without which execution wouldn't have been possible.

References

[1] Internet of Things (IoT): A Literature Review Published in Journal of Computer and Communications, April 2015 - https://www.researchgate.net/publication/280527542_Internet_of_Things_IoT_A_Literature_ Review
[2] Integration of Cloud Computing and Internet of Things: A Survey Published in Future of Computer Systems, October 2015 - https://www.researchgate.net/profile/Antonio_ Pescape /publication/283236612_Integration_of_Cloud_ computing_and_Internet_of_Things_A_survey/links/5b6d510a92851ca650543e3a/I ntegration-of-Cloud-computin-and-Internet of-Things-A survey.pdf?origin=publication_detail
[3] Biometric Attendance Monitoring System Using Raspberry Pi and Fingerprint - Published in International Journal of Engineering Sciences & Research Technology, April 2016 - http://www.ijesrt.com/April-2016.html
[4] ZhianTec fingerprint sensor – Github for an introduction to the code aspects

Implementation of Navigation System using *NavIC*

Abhishek Singh
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
abhisinghraj000@gmail.com

Ishaan Anand Shinde
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
ishaan.shnd@gmail.com

Om Pancholi
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
om.pancholi07@gmail.com

***Abstract*— Navigation with Indian Constellation (NavIC) is an independent regional navigation satellite system designed to provide position information in the Indian region and 1500 km around the Indian mainland. It is a regional system and will consist of seven satellites. In this project we have been planning to make device which will be interfaced with processor board and processing unit and NavIC tx/rx chip and programmed according to its functionality which can be used in bots or automated vehicles for navigation purpose. We will use NavIC instead of GPS as it is designed only for Indian applications for now and it has far more accuracy and precise positioning. The main aim of project is Implementation of Navigation System Using NavIC.**

Keywords—NavIC , Navigation, Navit,Python, Development board.

I. INTRODUCTION

A navigation system is a computing system that aids in navigation. Navigation systems may be entirely on board the vehicle or vessel that the system is controlling (for example, on the ship's bridge) or located elsewhere, making use of radio or other signal transmission to control the vehicle or vessel. In some cases, a combination of these methods is used. This project is targeted at designing a navigation system that will help people in navigating their ways through specific areas like the institute campuses, office campuses, etc. The IRNSS or the NavIC will be used as the communication satellite in this case instead of the GPS, as the accuracy of the IRNSS is decently more than that of the GPS due to the use of two frequency bands (L5 and S). It covers India and a region extending 1,500 km (930 mi) around it, with plans for further extension. An extended service area lies between the primary service area and a rectangle area enclosed by the 30th parallel south to the 50th parallel north and the 30th meridian east to the 130th meridian east, 1,500–6,000 km (930–3,730 mi) beyond borders. The system currently consists of a constellation of seven satellites, with two additional satellites on ground as stand-by.

II. LITERATURE SURVEY

For the past three decades, Global Positioning System is the only option for Positioning, tracking, location and timing applications to the people in and around the earth. On the other hand, this has been changed by coming out of local competitors like GloNASS, Galileo and our recent IRNSS (Designed and controlled by ISRO). For life safety of the people, GPS alone cannot offer the rigorous performance in selectivity, accuracy, integrity and availability. On taking account to the Indian circumstances, there are numerous limitations of using GPS. The important limitations are; selective availability and anti-spoofing. For complex and hostile situations also GPS not guaranteed in terms of accuracy. To overcome these limitations in Indian footprint, the government plans to develop our own surveillance system is called Indian Regional Navigation Satellite System (IRNSS). IRNSS is an independent local navigation system developed by Indian Space Research Organization (ISRO) under the control of Government of India. The mission of new navigation system (IRNSS) is under construction and it will come to people use by the end of 2016. With the rapid development of society and the changes of the traffic data on the metropolitan road, elective path is no longer simply the shortest distance on the geographic location, but also considering into account the real-time traffic information.

[1] An Intelligent IRNSS navigation system based on Internet of things (IOT) platforms. Year of publishing: June, 2016.

The research paper briefly discusses about the limitations of using the GPS system on Indian routes, how the IRNSS can prove to be efficient in doing the task of navigation in India. Also discusses the integration of real time data with IRNSS information and dynamic allocation of routes.

[2] Acquisition and tracking of S-band signals of navigation with Indian Constellation (NavIC). Year of publishing: June, 2019

This research paper provided an elaborate detail on how the IRNSS utilises L5 and S bands to provide accurate real time data and how the noise can be reduced in the tracking phase.

III. RESEARCH GAPS

The primary aim of our research is to learn and understand the drawbacks of using the Global Positioning System on Indian foot prints. The major

drawback of using GPS as the communication satellite in the Navigation System is the lack of availability of local data. The GPS being highly accessible is largely used globally, which is a little different in case of IRNSS. The IRNSS to be largely accessible in devices like mobile phones (Smart phones) requires a chipset level compatibility. Using NavIC instead of GPS can help in implementation of a navigation system for navigating through a specific region.

IV. Problem Definition

In a large campus like BHU i.e. Banaras Hindu University, it is often found that people who visit for the first time, they find it difficult to get quickly to the right destination considering the vast area of the campus. Sometimes where they can reach in 10 minutes because of multi ways they reach there in 20 minutes. For the current generation or even the active section of the population that is more technology dependent, it is tiring to navigate through the area using offline maps (especially in cases of relatively larger region).
Create a system that would help people to navigate through university campuses, office complexes, societies, etc.

V. Proposed Methodology

Receiving antenna - This block is used to receives satellite signal. Roof mounted and window mounted basically these two types of antennas are used with NavIC timing receivers. It is a circular polarized antenna. Low Noise Amplifier - It is an electronic amplifier that amplifies low power signal. This amplifier also found in other application such as radio communication systems and medical instruments. Low Noise Amplifier concerned with weak signal only which is just above the floor signal. Down Converter - This type of converter used to converts the frequency of received signal to an Intermediate frequency (IF) signal. IF Amplifier - It amplifies the Intermediate frequency signal. It is also used to raise signal levels in different type of receiver such as television and radio. It is commonly used in different circuits like Shunt capacitance coupling and Mutual inductance coupling. Analog to Digital Converter (ADC) - It performs the conversion of analog signal which is obtained from Intermediate frequency amplifier to digital. It is said that sampling and quantization block are also present somewhere in ADC. It is also used in microphone and digital camera. Digital Signal Processor (DSP) - It is specialized microprocessor chip. It is used to generate Civilian Acquisition (C/A) code. They are widely used in telecommunications, and in common consumer electronic devices such mobile phones. Basically the goal of DSP is to measure, filter or compress continuous real world analog signals. Microprocessor - Basically it performs the calculation of position and provide the timing signals in order to control the other digital block. It is used to useful information to display unit in order to display it on the screen. The microprocessor in a NavIC receiver that manages data collection and it is also called as home application of the software driving the receiver.

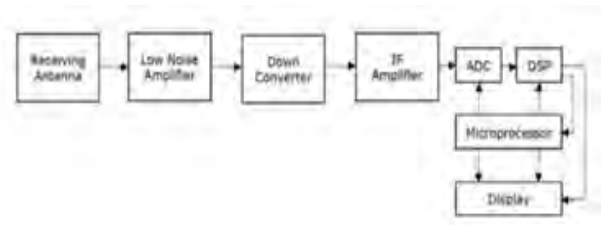


Fig.1 General Receiver Block Diagram

Hardware:

NavIC + GAGAN / GPS SMD Receiver Module:

The S1216F8GI2 is a satellite navigation receiver capable of using NavIC L5, GAGAN L1, and GPS L1 sign al to provide 3D navigation in a single compact SMD module. The S1216F8GI2 has 56 tracking channels and could track all in view satellites. It is fully autonomous such that once power is applied, the receiver automatically searches, acquires and tracks satellite signals. When a sufficient number of satellites are tracked with valid measurements, the receiver produces 3D position an d velocity outputs.

NavIC + GPS dual satellite capability enables using greater number of satellite signal than GPS only receivers. The increased satellite number offers superior performance in challenging urban canyon and multipath environments.

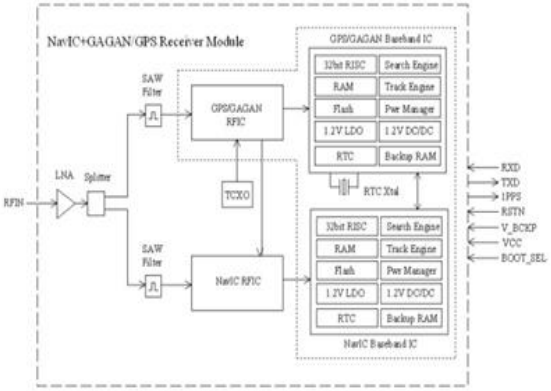


Fig. 2 Receiver Module

Raspberry pi 4:
The Raspberry Pi 4 is integrated with broadcom 2711, 64-bit quad-core Cortex-A72 processor and 2GB RAM. It feeatures true gigabit ethernet port, 2 x USB 3.0 “Super-Speed” ports. 802.11b/g/n/ac wireless LAN (2.5 GHz & 5GHz) Bluetooth 5.0 Dual micro-HDMI ports, 4K UHD video H.265 decode (4kp60)H.264 decode (1080p60).

Fig.3 Raspberry Pi 4

The Raspberry pi can be used as medium for the user to observe and interact with the data received from the Navic Module. Raspberry Pi can be finally interfaced with a compatible display and the application created can be used by the user to observe the received data.

Software:
Initially we begin by studying the raspberry pi or any similar development board and it's different applications in which it can be used and also understanding all the different pins and ports. After that we will install python as we are going to code Raspberry pi using python for the Navit applications.

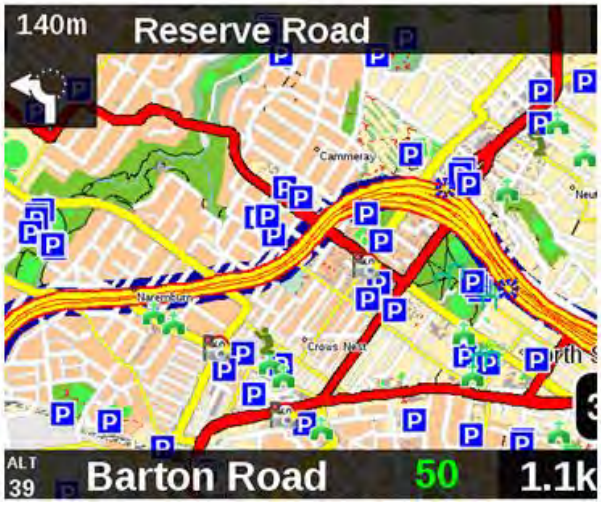


Fig. 4 NAVIT Application

After writing the code for the application we will finally interface the NavIC module with our raspberry pi. Then after the interfacing is complete and network gets established we will download the downloadable maps and load them in it. After this step our device is ready to get interfaced with different devices for various functions.

Fig.5 Receiver Module

Firstly we start by studying the raspberry pi or any similar development board and it's different applications in which it can be used and also understanding all the different pins and ports. After that we will install python as we are going to code Raspberry pi using python for the Navit applications. After writing the code for various applications we will finally interface the NavIC module with our raspberry pi. Then after the interfacing is complete and network gets established we will download the downloadable maps and load them in it. After this step our device is ready to get interfaced with different devices for various functions. This is just the over view of our project explained in a nutshell

VI. Expected Outcome

The implemented device should successfully be able to help to navigate through specific regions. As the communication satellite used for the navigation is the IRNSS or the NavIC that has a position accuracy of around 5 meters. The GPS system uses primarily the L band which can lead to a compromise in the accuracy. The available GPS tracking devices or navigation devices are found to have multiple limitations on the Indian routes. The IRNSS seems to have a slight upper hand in this case. With seven satellites, the NavIC covers only India and its surroundings and is considered to be more accurate than the American system. NavIC will provide standard positioning service to all users with a position accuracy of 5 metre. The GPS, on the other hand, has a position accuracy of 20-30 metre.

VII. Conclusion

The Raspberry pi will be used to implement this device successfully. Along with the Raspberry pi, instead of the GPS module, the NavIC module will be used to communicate with the IRNSS for navigation. The official Raspberry pi touch screen display can be used to see the final output as well as to interact with the system. The Navit software application which can be easily used on the Raspberry pi will be used to navigate. The Navit application supports Garmin, Open street maps for data on maps. The NavIC module interfaced with the Raspberry pi will be used to communicate with the NavIC satellite just as it is done with the GPS systems. In the era of automation, this navigation system shall have a great impact. For future innovation, the interfacing of this navigation device with a variety of other independent devices shall be studied.

References

[1] Dunhil Vishwas Fernandes, Pritesh Kumar Jain, Srinivas V N, Viraj Chavan, Gayathri K M, Thangadurai. N "Acquisition and tracking of S-band signals of navigation with Indian Constellation (NavIC)", june, 2019.

[2] M.Karthick, A.P.Jayamurugaraja, S.Santhosh, S.Venkatesh "An Intelligent IRNSS Navigation System Based on Internet of Things (IoT) platform", june, 2016.

This page is kept blank intentionally

Design and Implementation of Industrial Surveillance System for Oil and Gas Industry of Textile Industry

VikasKeshari
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
vikas.keshari02@gmail.com

AmitaGautam
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400
*101*amitagautam236@gmail.com

Sujit Pandey
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400
*101*Sujitpandey@gmail.com

***Abstract*—This paper presents the development of a low cost, implementation and automation of an industry. The proposed surveillance system for an oil and gas industry can be remotely able to be controlled or dealt with without difficulty. Automation is the development and implementation of technology with minimal human involvement to create and distribute goods and services. The implementation of automation technologies, techniques and processes improve the efficiency, reliability and speed of many task that were previously performed by human. Automation covers application ranging from a household thermostat controlling a boiler, to a large industrial control system with tens of thousands of inputs measurements and output control signal India have seen many incidents that claimed several lives due to gas tragedies. There are many major industrial accidents which were cause by oil and gas leakage. Recently, there was a gas leak at LG polymers private limited in Vishakhapatnam plant which nearly killed-13 people and injured more than 1500 people. The gas leak was due to the incompetence of the LG polymer plant where the styrene chemical product was evaporated as the temperature rises and spread over a three-kilometer area that affected five villages Hundreds of people rushed to hospitals because of breathing problems and burning eye sensations, and most of them were found lying unconscious on the ground due to exposure to gas. Due to gas exposure, many lives were pushed into danger so considering one's safety we are designing a surveillance system for oil and gas industry which will monitor and control industry at every minute by taking reading and generating sheet as well as alarm into industry as well as outside the industry to the authorized person. Taking about the surveillance system, continuously monitoring the temperature around the storage tank so that temp won't rise to a level of explosion if it rises then control unit should start working and cooling fan will start to lower the temperature around the storage tank. If the temper rises to the higher level then authority will have the record of attendees present in the industry. In industry there are several departments which take lot of time to generate datasheet for that we will also design a sever which will generate datasheet in less time while being anywhere..**

Keywords—Raspberry Pi, oil and gas plant, Surveillance, database, Server, temperature

I. INTRODUCTION

The Oil and Gas Industry is a major industry that drives several other industries, is crucial for world energy consumption and consequently has tremendous impact on the global economy. It includes processes for exploration, extraction, refining, transportation, and marketing petroleum products.Surveillance systems are an essential part of a security for home, business etc. Surveillance systems are used from wireless cameras to alarm system. The word surveillance comes from French word 'sur' means 'from above' and 'veiller' means 'to watch'. Surveillance system is used for security purpose in many fields like traffic, military etc. and it is very useful. Today all small scale, big scale industries are using surveillance system for security purposes. The project is about Surveillance system for Oil and gas industry. In oil and gas industry Scada system are used for automation purpose which is very complex in design and nature but in this project, we are using raspberry pi which is simple in structure and can implement alert messages, alarm etc. In our project there are tanks of oil and gas industry respectively. There are temperature sensor and humidity sensor which are used to sense oil and gas, and collect the data which is stored in database. It will give data to severer. Then, the data will be collecting in datasheet. For database we have used PHP to connect with server XAMPP. Nowadays industries want simple and good structures for surveillance system, we are using raspberry pi for easier conveniences. The main aim of project is to monitor and controlling the industrial area and data of industry. This project will provide you all the details to the owner through mail and alert messages. In response to that of alert message temperature around the tank should cool down. For that we are using a cooling fan with a control fan speed to lower the temperature [1]. This project can be used anywhere away from industry. It helps the owner to see through mobile. It can be used as a good product in future.

II. LITERATURE SURVEY

During the construction of the industry, monitoring and regulating the temperature-humidity is an important aspect. The temperature-humidity can have an important impact on the regular operation of plants, the reliability of observed data, and the quality of observed results. The construction of the temperature and humidity monitor-control system for the industry is both unavoidable and required. This paper introduces the industry's automated temperature-humidity measure and control devices, which is guided by a microcomputer and comes in the form of the host computer. A considerable one will be the oil temperature of the oil storage tank which will be sense by the temperature-humidity sensor. This is very important operation parameter to be power transformer, it is essential to detect abnormal tank temperature in time and take time to Suitable procedures to ensure the secure operation of the Substations of the industry for further Control [7].

A centralized method of online control has been introduced. The sensor is placed around the oil tank, and in the nearby storage tank room, the controller is installed. The related measurement values and signals are transmitted to the

station's central management unit. The microcomputer will sense the signals from the sensors in order to observe the smooth operation of the sensor. The microcomputer can reintroduce data processing and final user application interface in addition to communication with the microcomputer, transmitting data and sending control signals immediately. The host computer completes the display, query, and printing functions [4].

The software consists of the control application the operational application and the panel for setting parameters and can be transferred between each section. The control system performs four: automatic detection, control, alert in the case of temperature and humidity rises to a certain aspect, and attendees record into the industry. The accurate employee attendance data is very necessary for maintaining the employee's supervision and discipline. Traditionally, employee attendance is manually used by the paper-based attendance sheet. In this manual system, the manager of the company hardly manages the employees updated information and evaluates their working hours and performance this process spends inefficient time-consuming in attendance records calculation, employee time shifts management, every time tracking, and high cost of the paper sheet. The database engine used to store employee records in several different locations makes it more difficult to handle data. Additionally, the expense of the fingerprint device is reasonably expensive. Some other methods of employee attendance using various technologies have been proposed. With respect to the fundamental parameters primarily concerned with attendance monitoring setups, we compared them. Important terms measuring time attendance were addressed as follows. Firstly, the biometric authentication reader uses the Cloud-TA Time and Attendance System to capture employee data and send the data to the server through internet communication, as well as control and data backup. There are some limitations to the detection speed of the system [3].

There have been many problems in the current technologies being used into the oil and gas industry that shutdown of industry if any fault in any section which cause in delay in work between server and client to overcome from these servers is design for every department to solve the network complicity.

III. PROPOSED SYSTEM

In this proposed system, the traditional automation infrastructure of oil and gas industry PLC were used and these were replaced in our proposed prototype. The PLC node is removed by RASPBERRY PI(RPI/Microcomputer) for the automation purpose. When the sensor will be interfaced with raspberry pi and placed around the storage tank, it will work as node. To communicate with node a sensor is connections is made using USB cable, as RPI understand only Python languages. One's communication is stablished between RPI and sensor the RPI will start collecting data as input from the sensor. These data will be stored into the database where the data processing and calculation will take place and a result will be carried out for the further decision. The condition will result the data as per that decision alarm will generated for inside the industry as well as outside the industry which refer to IOT. Through a web interface, the cloud-based framework can be accessed and all databases can be stored on servers with a more stable link and frequent backups. It also makes it easy to access, change, report and analyze data. The study suggested a cloud-based system of time and attendance that allows workers to log in and out over the internet, allows employees and supervisors to track time and enforcement, schedule employees, and report. When workers and managers can access real time from anywhere to manage and make a good decision, the employee and attendance data would be more effective. In addition, greater versatility and low cost in terms of hardware and software resources will help all industries through the use of the attendance system shown in fig.4. The cloud-based time and attendance monitoring system is therefore coming to our attention. Cloud technology has recently been incorporated with the employee attendance system for greater data processing efficiency by visualization technology [3][6].

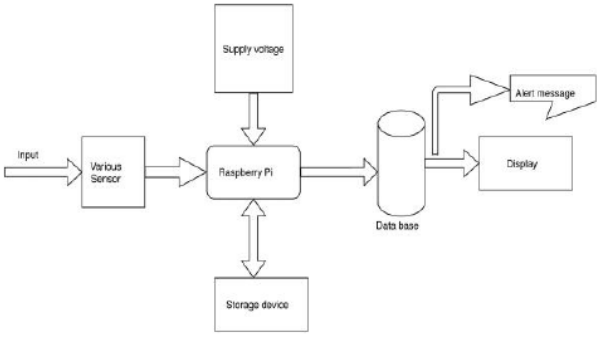


Fig.1. Overview of the proposed system

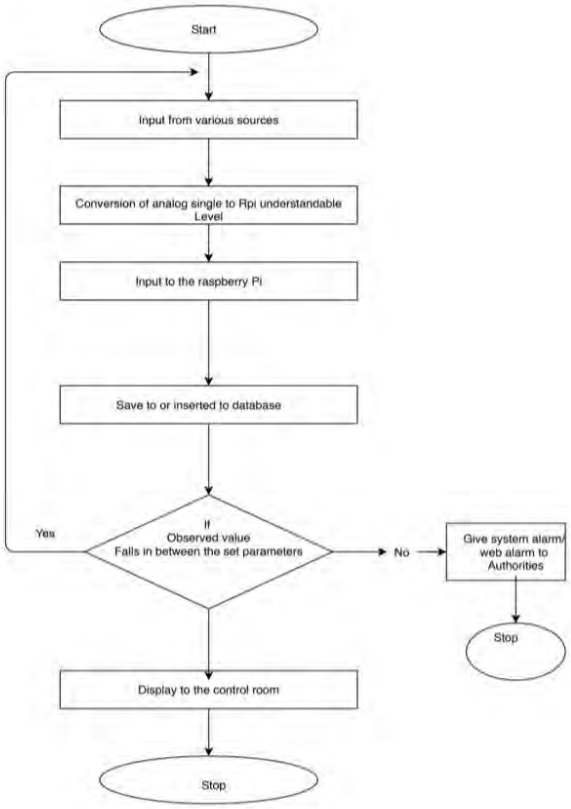
DESCRIPTION

Raspberry pi shown in fig.1 is the third bestselling computer brand into the world. RPI is credit card side computer that plugs into the tv or display, and a keyboard and a mouse. The RPI can be use as learning coding and building electronics project, and for many of the things that desktop PC does, like spreadsheet, word processing, browsing the internet, playing games etc. With the Pi 3 being faster, able to decode 4K video, benefiting from faster storage via USB 3.0, and faster network connections via true Gigabit Ethernet, the door is open to many new uses. We are using it as a central unit of our project to interface various sensors by giving it a proper power supply and a storage device. RPI 4 is the latest raspberry pi introduced in the market [5].

Fig. 2. Raspberry pi (RPI/Microcomputer)

shown in fig.3 is a flowchart for overall prototype execution. Sensor is interfaced with the Raspberry pi so that sensed data from the sensor can be obtained and stored. The fetch data into database will take over the further execution and calculation. On the basic of stored data, data will be compared with current and previous stored data and it will give the results which will displayed on the display unit and to generate the alert message and the execution will roll back. The XAMPP PHP server is used to store databases and to generate the datasheet. The DHT11 is a sensor for temperature and humidity that is widely used. The sensor comes with a dedicated temperature measurement NTC and an 8-bit microcontroller to output serial data for temperature and humidity values. The sensor is also factory calibrated and is therefore easy to communicate with other microcontrollers. With a precision of ± 1 ° C and ± 1 per cent, the sensor can calculate temperature from 0 ° C to 50 ° C and humidity from 20 per cent to 90 per cent. So, this sensor could be the right option for us to measure in this range.

IV. FLOWCHART



One of the commonly used cross-platform web servers, XAMPP lets developers create and test their programs on a local webserver. It was developed by Apache Mates, and the audience can revise or change its native source code. For various programming languages, such as PHP and Perl, it consists of Apache HTTP Server, MariaDB, and interpreter. It is available in so many languages and is supported by various platforms, such as the Windows IA-32 and macOS x64 bundles, and Linux. There were four department table in our prototype and one login webpage which will also work as IOT for monitoring the industry from being anywhere. The will be privilege to the authority for access to the server for security reason.

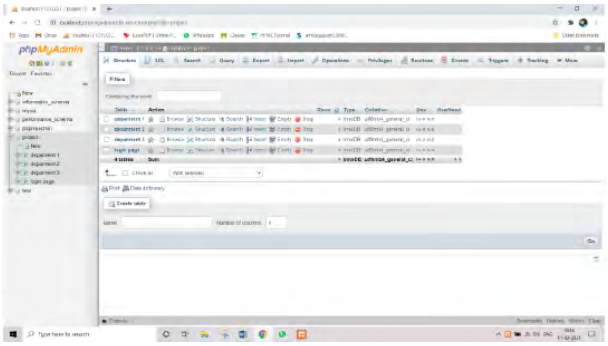


Fig. 4. Picture shows list of database table

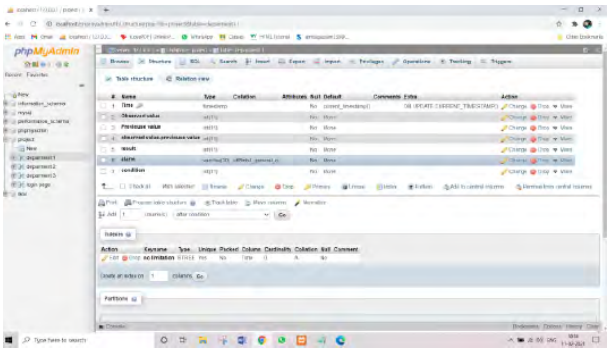


Fig. 4.1 Picture shows attributes of a table

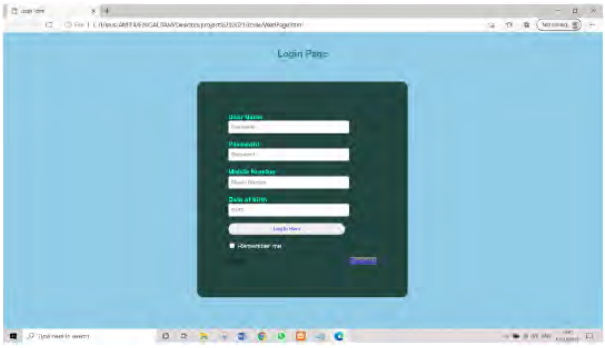


Fig. 4.2 Picture shows login page at the user end

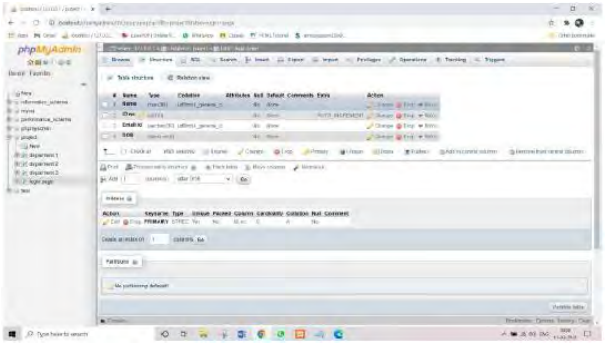


Fig. 4.3 Picture shows attributes of login page

Fig.7 FLOWCHART

Sr. No	***Name of Component/Software***	***Specification***
1	Temperature sensors	DHT 11 SENSORS
2	Humidity sensors	DS18320
3	Controller/Development board/microcomputer	Raspberry pi 3
4	SMPS	Lrs-150-12
5	Python	Development Environment (IDE)
6	Python, PHP	Transferring data from RPI to database
7	HTML, PHP/CSS	Fetching and analysis of data at user end

Table.1. Picture shows list of hardware and software used

VI. CONCLUSION

The project is all about industrial surveillance system for oil and gas industry. In this proposed prototype, we are using raspberry pi as node for better performances. The node is connected to the server which is referring as control room. Design has very simple structure because we are using less hardware as of other industry. Complicity will be solved. As prototype is going to be a real time operator for the industry security can be carried out, performance may improve and life safety will improve.

REFERENCES

[1] Syahril Ardi, Agus Ponco, Rizky Awaludin Latief "Design of Integrated SCADA Systems in Piston Production Manufacturing Case Study on the Conveyor, the Coolant, the Hydraulic, and the Alarm Systems using PLC CJ1M and CJ1W-ETN21". Proc. of 2017 4th Int. Conf. on Information Tech., Computer, and Electrical Engineering (ICITACEE), Oct 18-19, 2017, Semarang, Indonesia.

[2] M. Tariq Iqbal, Lawrence O. Aghenta "Development of an IoT Based Open Source SCADA System for PV System Monitoring". 2019 IEEE Canadian Conference of Electrical and Computer Engineering (CCECE).

[3] Sai Ba Oo∗, Nang Hlaing Myat Oo†,Suparat Chainan‡, Arpha Thongniam§ and Waralak Chongdarakul "Cloud based web application with NFT for employees attandance management system" IEEE 2018.

[4] Milorad Papi´c , Zlatko Bundalo , Du˘sanka Bundalo , Radovan Stojanovi´c , ˘Zivorad Kova˘cevi´c , Dra˘zen Pa˘sali´c , Branimir Cviji´c "Microcomputer based emmbedd SCADA system and RFID system implemented on Linux platform" https://doi.org/10.1016/j.micpro.2018.08.009.

[5] Ramchandra Karde*1 & Prof R P Chaudhari2, "Industrial security monitoring and control system thorough Android app using raspberry pi, Irctcet 2018.

[6] ACHONU O. ADEJO**, ADEIZA ONUMANYI, JANE M. ANYANYA AND OYEWOBI S. O "Oil and gas procces monitoring through wireless sensor network: survey", ISSN 2018.

[7] Lijun Zheng1, Yaping Ying, Wenming Wang," Automatic

Use of Solar Dryers in Agricultural Products

Pratik Jain
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
pjain2418@gmail.com

Raj Burde
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400
saloniburde@gmail.com

Satyam Sharma
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400
satyam.a.sharma@gmail.com

Aniket Yadav
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
aniketyadav2710@gmail.com

Akshat Doshi
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400
adakshatdoshi34@gmail.com

Dhruv Shelke
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400101
dhruvshelke588@gmail.co

Deepak Borana
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400
djdeepakborana@gmail.com

Abstract **— if we take the case of India with our population of over 1.3 billion, we have wastage of over 15-20% of our annual production of fruits and vegetables. These losses happen when they are traditionally sun-dried. In this process, there is a danger of the crops getting affected by insects, dust and weather. This affects the income of the farmers and overall affects the economy of the country. To overcome this problem, we have come up with a solution that increases the shelf life of the product and preserves the flavor of the end product. A Solar dryer is an enclosed cabinet that is used to dry agricultural products. This process reduces the moisture levels of the product increasing its shelf life. This paper deals with different types of solar dryers and a detailed comparison of their cost, ease of installation, working capacity.**

Keywords— Solar energy, Solar dryer, Solar Tunnel, Agriculture products

I. INTRODUCTION

The food that we eat today comes from various processes done on agricultural products. Some of them are ethical and some are unethical but still practiced. The food should we have should be high in fiber, vitamins, proteins and healthy fats. This quality of food can be achieved by freezing the product or drying the product. Now the problem with freezing is it requires a big freezer and a constant energy supply which is very costly but there is a better solution Solar drying. The open solar drying of foods is been there in our culture from many years but this process takes a lot of time and also there is a constant threat of insects, uncertain weather, temperature irregularities etc. This affect the quality of the end product and health of end user. So the better solution is closed sun dryer. Now there are many types of sun dryer used according to the requirements of the user.

I.1 Types of Solar Dryers

I.1.1 Direct Type Dryers

In direct or natural convection type dryers, the agricultural product is placed at the bottom in a blackened enclosure with a transparent cover. The solar radiations are directly absorbed by the product itself. The food product is heated up and the moisture from the product evaporates and goes out by the natural convection/circulation [1]. Through an exit in a corner.

I.1.2 Indirect Solar Dryers

In these dryers the food product is placed in a drying chamber. The air is heated in solar air heaters and then blown through the drying chamber. In some of the designs, dryers receive direct solar radiations and also heated air from solar air heaters [1]. In these dryers we can control the temperature, humidity and drying rate is possible as required for the product to some extent.

I 1.3 Forced Circulation Type Dryer

In these dryers, hot air is continuously blown over the food product. The food products itself is loaded or unload continuously or periodically. These kind of dryers are comparatively thermodynamically efficient, faster and can be used for drying large agricultural product. These dryers can be of Cross-flow type, concurrent flow type or counter-flow type. [1]

II. LITERATURE SURVEY

The amount of energy from the sun that reaches Earth each day is enormous. All the energy stored in Earth's reserves of coal, oil, and natural gas is equal to the energy from only 20 days of sunshine. While areas such as Gujrat, Rajasthan, Madhya Pradesh most areas receive enough sunshine to make solar energy practical. Solar energy can be used in agriculture in a number of ways, saving money, increasing self-reliance, and reducing pollution. Solar energy can cut a farm's electricity and heating bills. Solar heat collectors can be used to dry crops and warm homes, livestock buildings, and greenhouses. Photovoltaic (solar electric panels) can power farm operations and remote water pumps, lights, and electric fences. In our research we will be elaborating how the use of Solar Dryers can be more advantageous when compared to other widely used methods of Dryers in agriculture. While the setup of Solar Dryer and appliances related to it can be costly, it is definitely worth the amount of money in the long run. Solar power is less expensive than extending power lines over a long span of time.

III. RESEARCH GAPS

The In this paper we came to know about a new type of solar dryer tunnel. Which uses some north pole related technology which is not used by leading manufacturers. Also it requires one time investment and relatedly negligible maintenance cost.

III.1 Advantages of Solar Dryer

There are many advantages of Solar Dryer like it provides an increased temperature than the outside environment and decreased humidity results in increases rate of drying. This process increases the shelf life of the end product. Also it provides protection from rain, flies and dust; we can also leave our product overnight and during rain also. The quality of the product is better in terms of nutrients, hygiene and color, It permits early harvesting and reduces the field losses of the products, it permits better planning of harvesting season, It reduces spoilage in storage drastically [1], farmer can maintain the quality of his/her product and hence can get better prices for it, also transportation of dried products is easy.

III.2 Disadvantages of Solar Dryer

There are some disadvantages of solar dryer. Like it can work majorly in summer days and it also requires a high initial investment. But it can recovered in 3-4 years

IV. PROBLEM DEFINITION

One of biggest problem in our country today is farmers income and also the quality of the grains, vegetable and fruit that we eat. The wastage of the crops due to weather and insect results in poor yields. And this directly affects the income of our hardworking farmers and indirectly affects the health of humans that consume it and also the economy of the country. The lack of knowledge and facilities are main reasons for this wastage of crops

V. PROPOSED METHODOLOGY

During this research we came across various companies which manufacturer's different types of solar drying systems according to the requirements of the end user. Some companies like Shiv Sagar Herbal, Bhuj, Gujrat, Society of Energy Environment and Development (SEED) NGO, Hyderabad, Rudra Solar Energy, Surat manufacturers' different types of solar dryers. Also all these companies are Indian companies. Some of the product are-

V.1 Society of Energy Environment and Development (SEED), Hyderabad

Fig. 1. Solar Cabinet Dryer Model- 400

Fig. 3. Solar Cabinet Dryer SDM-25

This company also provides models SDM- 500,100 and 50 depending upon the need of the customer. The Society for Energy, Environment & Development (SEED) has successfully designed and developed a novel and unique solar cabinet dryer in 1999 under the sponsorship of UNDP. It was put to test for its groundbreaking technological innovation with several applications in drying of forest produce, fruits, vegetables, and spices. This was carried out through the projects, sanctioned by Department Of Science and Technology (DST) and further commercialized the model SDM-50 with the financial grant by REPSO(USAID Assistance). As a result, the solar drying technology is coupled with the practices of Food, Science and Technology in the area of agri-horticultural products. The outcome is the emerging solar food processing technology with special emphasis on dehydration of fruits and vegetables in the form of fruit bars and dried fruits and vegetables.

TABLE I. TYPES OF SOLAR CABINET DRYER BY SEED

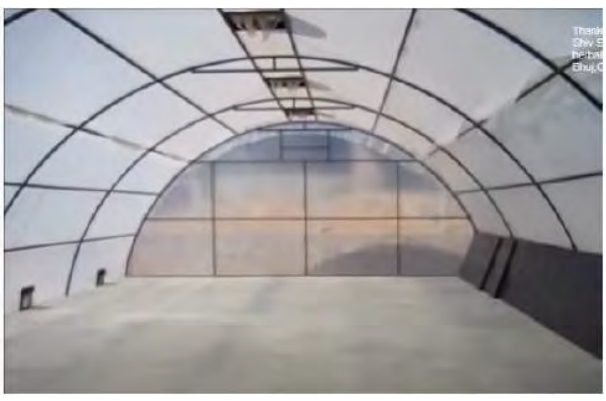
S.No	Model	Max. Loading Capacity (Weight)	No of SS Trays Size 1100x260 x20mm	Solar Window	Drying Area	Solar Photovoltaic panel 12V DC	Electri--cal Backup 220 V.A.C.
1	SDM-25	25kg	6	1.12 sq.m	1.8 sq.mm	10 W	2 KW
2	SDM-50	50kg	12	2.23 sq.m	3.6 sq.m	30 W	3.6 KW
3	SDM-100	100kg	24	4.46 sq.m	7.2 sq.m	60 W	6.2 KW
4	SDM-200	200kg	48	9.00 sq.m	14.2 sq.m	60 W	14.5 KW
5	SDM-400	400kg	96	18.00 sq.m	28.8 sq.m	120 W	25 KW
6	SDM-500	500kg	120	22.30 sq.m	43.20 sq.m	120 W	25 KW

The solar cabinet dryer technology has been patented in India vide Patent No.211911 SPECIAL FEATURES OF THIS TECHNOLOGYSPECIAL FEATURES OF THIS TECHNOLOGY

The special features of these solar dryers are:

- The temperatures achieved in the cabinet are in the range of 40-65□C on clear sunny days.
- The temperature difference between the ambient and inside cabinet is 15 to 30□C on good sunny days.
- The moisture control in the product is achieved by the regulation of drying time, basing on the intensity of solar radiation.
- Closed or mesh trays are provided for easy loading and unloading of product.
- Solar PV fan for air circulation.
- A special glass filter is provided to cut off U.V radiation and reduce the solar intensity for special applications. (Optional at extra cost)
- A clean and hygienically prepared product, meeting the cleanliness specifications of international standards, is processed in these dryers.

These dryers are modular and to scalability of the design to any size of demand.



V.2 Shiv Sagar Herbal, Bhuj Guajrat

In a brief conversation with the owner and manufacturer Mr. Ramesh Chandra Joshi we came to know about his product in Fig. 4. It can be used in any types of herbal leaves and it can keep the moisture level below 7%. He told us that to install this device they take the longitude and latitude of the place and also last three years of weather data to design their solar dryer tunnel. Along with herbal leaves this tunnel can be used in drying papad, vegetables slices such as mango, awala, banana or chili and many more items. This tunnel cost around 4-5 lakhs for 1300 sq.ft which is the cheapest tunnel as compared to other tunnel according to loading capacity. This tunnel requires no electricity as all the turbines in this tunnel are air driven so this helps in keeping low moisture and high temperature inside the tunnel. And due to non-requirement of electricity this tunnel can also be used in the villages where there is less electricity.

VI. EXPECTED OUTPUT

As we discussed about this solar dryer tunnel now about output he told us that during summer this tunnel can produce

Minimum three batches of 150 Kg of any herbal leaves or other products in 24 hours. So it can recover its cost around 2 years. It also requires less maintenance around 15paise/Kg that to after 400-500 tons of output as compared to other solar dryers which contains chimney, solar panels which requires an annual maintenance. Other company SEED gave us a detailed output table of the output.

S.No	**Product**	**Drying Conditions**					
	Items	**Loading Capacity Kg / m2**	**Yield** (%)	**Finished product Moisture** (%)	**Drying** Hrs.	**Cabinet** Temp. (o C)	**Ambient** Temp. (o C)
1	2	3	4	5	5	7	8
F R U I T B A R S							
1	Mango Bar (2 layers)	7	40	12	16	55	30
2	Guava Bar (2 layers)	7	40	12	16	55	30
3	Mixed Bar (2 layers	7	40	12	16	55	30
4	Sapota Bar (3 layers	9	40	12	24	55	30
5	Khatta - Meetha Bar (2 layers)	7	40	12	16	55	30
6	Fig Bar (2 layers)	7	40	12	16	55	30
7	Apple Bar (2 layers)	7	35	12	16	53	30
8	Apricot Bar (2 layers)	7	35	12	16	53	30
9	Plum Bar (2 layers)	7	35	12	16	53	30
10	Strawberry Bar (2 layers)	7	35	12	16	53	30
11	Jack fruit bar	7	35	12	18	50	28
12	Organic mango bar	8	63	12	16	50	30
13	Organic sapota-fruit and nut bar	10	80	8.5	56	52	35
14	No-sugar mango bar	7	32.5	12	16	50	28
F R U I T S L I C E S (After Osmosis)							
15	Apple Slices	2.5	16	8	10	50	30
16	Mango Slices	3.5	17	17	12	59	39
17	Sapota Slices	3	27	13	6	50	40
18	Pineapple Slices	5	21.4	14.7	14	45	29
19	Papaya Slices	7	16	10	16	54	30
20	Banana Slices	3.4	19	14.2	14	53	35
21	Guava Slices	2.1	13	14	8	49	33
22	Grapes (Raisins)	7	20	4	25	53	31
V E G E T A B L E S							
23	Potatoes	5	10	5	4	50	31
24	Donda	5	30	5	19	50	30
25	Carrot Crush	5	15	58	10	50	31
26	Carrot Slices	2.2	12	5	9	47	29

27	Tomato	5	10	5	10	60	30
28	Mushrooms	4	15	4	12	50	33
29	Bittergourd Crush	4	10	4	6	50	26
30	Bittergourd Slices	4	10	4	8	42	26
31	Onion	4	17	4	18	50	24
32	Raw Mango(Amchur)	4	22	4	16	50	30
33	Coconut	3	30	4	5	50	31
34	Cashew Nut	3	97	4	8	49	30
35	Green peas	5	10	10.26	12	49	28
36	Cauliflower	4.3	6	6	10	55	30
37	Cabbage	3.3	6	6	9	55	30
38	Okra	3	0.3	7	8	56	32
39	French beans	3	31	8	9	53	30
40	Beetroot	4	5	5	13	53	30
GRENLEAFYVEGETABLES							
41	Curry leaves	1.5	35	4	8	55	30
42	Spinach leaves	2	8	4	15	55	30
43	Fenugreek leaves	2	13	4	6	50	30
44	Tamarind leaves	2	11	4	12	55	30
45	Gogu leaves	2	16	4	15	55	30
46	Mint leaves	1.5	17	4	5	55	28
47	Drumstick leaves	2	15	4	6	55	29
48	Coriander leaves	2	12	4	6	50	28
49	Wheat Grass Powder	2	8	4	8	50	29
50	Amaranth leaves powder	3.3	4.3	4.2	8	45	28
SPICES							
51	Ginger powder	5	15	4	12	50	31
52	Mango Ginger	5	16	4	12	50	31
53	Garlic Powder	3	33	4	4	55	29
54	Red Chilies (Big Variety)	4	17	4	48	50	30
55	Red Chilies (Small Variety)	4	26	4	30	59	25
56	Pickle Red Chilies	4	25	4	24	55	28
57	Green chilies	8	12	4	6	55	27
58	Green chilies (Bajji Variety)	2	10	4	34	49	31
59	Pepper	2.5	5.23	6	13	52	29
FORESTPRODUCE							
60	Karaya Gum	2	35	10	19	55	30
61	Karakkaya	2	52	-	44	55	28
62	Sugandapala (Budipalagadda)	3	26	5	26	55	27
63	Maredugaddalu	7	25	5	16	54	30
64	Nelavemmu (Kalmegh)	3		5	12	57	30
65	Alovera (Green)	2	3	-	9	50	30
66	Alovera (White)	-	1	10	9	52	34
67	Amla Crush (Hybrid)	5	32	8	6.5	50	28
68	Amla slices (Forest)	5	30	8	10	49	27
69	Honey	2	91	17	5.5	55	28
MEDICINAL&HERBALPRODUCTS							
70	Rosemary	4	30	-	15	55	27
71	Spirulina Powder	4	18	4	6	60	28

72	Bamboo	2	10	4	8	57	29
73	Tulasi leaves	2	12	4	6	50	30
74	Turmeric	-	14	4	8	62	31
75	Rose Petals						
76	Noni	5	13	5	5	52	33
F O D I T E M S							
77	Maida	4	96	4	4	56	27
78	Vermicelli	6	35	4	4	55	28
79	Noodles	8	77	5	4	55	19
80	Fish	7	40	11	8	55	27
81	Ragi millets	3.3	76	6	5	50	30
82	Green gram	3.3	75	6.2	8	50	30
83	Dried fig(anjeer)	7	23	23	42	50	30
84	Noni powder	5	11.2	4	5	53	35
C H E M I C A L P O W D E R							
85	Silicon Carbide	2	80	4	3	60	29
86	Cellulose	3.5	50	4	7	60	28
OSMO-SOLAR DRYING OF FRUITS							
87	Mango Slices	3.5	17	17	16	43	32
88	Sapota Slices	2	26	12	6	55	39
89	Pineapple Slices	2	16	11	10	55	39
90	Guava Slices	3	17	14	8	49	33

VII. CONCLUSION

Preservation of food through drying is one of the oldest and the most widespread methods that can be used to enhance the strength of the food. Drying food is removing the moisture so that the product can be stored for a long time and be protected against Corruption. Using Solar Dryers can enhance the quality of the produce and help them drying faster and in a possibly better way by reducing losses, drying faster and more uniformly, and producing a better quality yield. As we have seen above there are two variants of Solar Dryers, the Solar Cabinet and the Solar tunnel. We concluded that solar cabinet is suitable for small scale projects, while the solar tunnel is more sufficed to be used in projects with a requirement of more than 200 kilograms.

ACKNOWLEDGMENT

We would like to thank the faculty at Thakur College of Engineering and Technology for giving us the opportunity to write and expand our views and knowledge on this topic. We would also thank the teachers who gave us this topic to write and share our views upon and the people who provided us proper

resources and data. For this we would like to thank Mr. Ramesh Chandra Joshi (Shiv Sagar Herbal) and SEED Ngo

REFERENCES

[1] Atul H Patel , Prof. S A Shah, Prof. Hitesh Bhargav, “Review on Solar Dryer for Grains, Vegetable and Fruits”, International Journal of Engineering Research & Technology (IJERT), vol.2, January-2013

[2] Umesh Toshniwal, S.R Karale, “A Review Paper On Solar Dryer”, International Journal Of Engineering Research And Application (IJERA), vol. 3, March-April 2013

[3] K. Nagendra Babu, P. Sudheer Kumar, D. Yamuna, “A Reasearch on Development of a Fixed Solar Dryer with a Practicak Research”, International Journal of Innovative Technology and Exploring Engineering (IJITEE), vol . 8, July 2019

[4] Lyes Bennamoun, Azeddine Belhamri, “Design and Simulation of a Solar Dryer for Agricultural Products”, Journal of Food Engineering , February 2003

[5] Masanaji R. Nukulwar, Vinod B. Tungikar, “Evaluation of Drying Model and Quality Analysis of Turmeric Solar Thermal System”, Applied Solar Energy, vol. 56, 2020

[6] Nahin Tasmin, Abu Toib Salman, “ A Study of Design, Construction and Performance Test of a Hybrid Double Pass Solar Dryer”, International Journal of Scientific Research and Engineering Development, vol. 3, Feb 2020

[7] A. Senthilrajan, K. Raja, C. Ramji, “Productivity Enhancement of Pentagon type Solar still and Dryer in Series using Biomass Energy”, International Journal of Advance Research, Ideas and Innovations in Technology (IJARIIT), vol.4, 2018

[8] N. K. Mahara, P. Nema, “Comparative Analysis of Forced Convection Direct Solar Dryer by varying the Dryer Load and Mass Flow Rate”, International journal for Scientific Research & Development, vol.4, Sep 2017

[9] N. K. Mahara, P. Nema, “Review on Solar Energy Dryer for Drying the Agricultural Products”, International journal for Scientific Research & Development, vol.5, Aug 2017

[10] A.O. Fagunwa, O. A. Koya, and M.O. Faborode, “Development of an Intermittent Solar Dryer for Cocoa Beans”, Department of Agricultural Engineering, Obafemi Awolowo University, Ile-Ife, Nigeria, Manscript number 1292,vol.11, July 2009

[11] SreedeviMadhavan, Dr. P N Ramachandran, “Design, Fabrication and testing of a solar paper dryer”, International research journal of engineering and technology, Vol.2, Issue 4, July 2015

[12] Ashish D. Chaudhari , Prof. Sanjay P. Salve, " A review of solar dryer technologies", international journal of research in advent technology, vol.2, No.2, February 2014

[13] Majedul Islam, MdImrul Lslam, Mehedi Tusar, "Effect of cover design on moisture removal rate of a cabinet type solar dryer for food drying application", International conference on energy and power (ICEP2018), 13-15 December 2018.

[14] Hajar Essalhi, Rachid Tadili, M. N Bargach, "Conception of a solar air collector for an Indirect solar dryer. Pear drying Test.", International conference on power and energy systems Engineering, September 2017

[15] Rahul Girase, Vishwas Mahajan, Ankita Kotwal, Akash Ugale, "A Solar Dryer Technology", International Research Journal of Engineering and Technology (IRJET), vol.7, Jan 2020

This page is kept blank intentionally

Development of Textile Industry using IoT for Temperature, Humidity and Cotton Dust Control

Vishal Chaurasia
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101

Vijay Iyer
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101

YashKarekar
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101

***Abstract*—Despite several attempts made by numerous governmental and non-governmental organizations around the world through various programs to raise awareness of reckless driving, accidents happen every now and then. However, if the ambulance service were able to get the crash data in time, more lives might have been saved. Using GPS, 4 G module and shock sensors, we are developing an embedded systems-based vehicle accident warning system. For accident detection, a shock sensor is used. So, this sensor will be active as soon as an accident occurs. And the data is sent to the microcontroller. At the same time, 4G modules that are attached to the same microcontroller will also be enabled. The precise position of the accident location is obtained via the 4G module and sends a warning message to the cell number and police station register through the 4G module. And data is sent to local police stations, members of family, friends, etc. As such, an effective automatic accident detection with an automatic emergency service notification with the location of the accident is a prime need to save the precious human life.**

Keywords—Real Time Car Accident Alarm System, Raspberry-pi, GPRS, Shock Sensors, Switches, 4G Module, Location

I. INTRODUCTION

The number of deaths is very high due to traffic accidents. Looking at the number of road traffic deaths and injuries the global road safety problem is illustrated by injuries. Almost 1.3 Every year, millions of people are killed and about 50 million people are killed. World-wide injuries due to road accidents, which average to Every day, 3,287 lives are lost. More than 50 percent of the traffic on the lane Fatalities affect young adults between 15-44 years of age. About Around In road traffic, 400,000 individuals under the age of 25 die Annual injuries. Also, in countries with excellent highways, Security steps, the number of casualties from road accidents Every year, higher. About 90 per cent of road traffic accidents. They are found in middle-income countries. In countries with low incomes, the number is even higher. The most likely cause for the death of a person in an accident is the lack of first aid provision due to the failure of emergency responders to obtain accident details in time. When it includes events involving car collisions, emergency response time is highly critical. Analysis shows that if we reduce the accident reaction time by just 1 minute, it can increase the odds of saving the life of a person by up to six percent. In order to minimize response time, it will be important to incorporate improved traffic technology, which would help scale back response time and thereby reduce the fatalities used by the GPRS module to produce the victim's exact position. The GSM/4G module was used to send the message from the produced position to the nearby hospital and police station. A special message format that includes the latitude and longitude of the location with a connection that can be used via Google maps to display the victim's location on any smart device

II. PROPOSED FRAMEWORK

The following sets of Sensors/Microprocessors which are used in the system design are listed as follows:

1. 4G & GPRS Raspberry Pi Hat
2. Raspberry-Pi
3. Shock sensors and other sensors
4. Switches

A. This Raspberry Pi HAT features NB-IoT, eMTC, EDGE, GPRS, and GNSS multi-communication features.The NB-IoT (NarrowBand-Internet of Things) and eMTC (enhanced Machine Type Communication) are advanced LTE (4G) IoT communication technologies, with advantages including low power, low cost, large coverage, etc. They are suitable for applications such as smart equipment, remote control, asset tracking, remote monitoring, e-health, handheld POS terminals, bicycle sharing, and so on. Although conventional 2G/2.5G technologies are capable of sending SMS or other wireless communications, GSM/GPRS and EDGE. Which stands for Light Detection and Ranging, is a remote sensing method that uses light in

the form of a pulsed laser to measure ranges (variable distances) to the Earth.

Fig.1 4G & GPRS Raspberry Pi Hat

B. The project's core device is a Raspberry pi. This is where you have to do all the programming things. So that the message will be sent to the person we choose as desired.

Fig.2 Raspberry-Pi

C. Shock detector is a device which indicates whether a physical shock or impact has occurred. Whenever any accident occurs this shock sensor will detect the impact and further will trigger the switch and micro controller

Fig.3 Shock sensors

D. A simple switch is provided in this project in case the victim is in conscious state then he/she can press the switch and terminate the entire process. The time limit to press the switch will be limited say 15 secs.

Fig.4 Switches

III. Proposed Architecture & Methodology

In this project, The Sensor will help to Triggered the Switch. Switch will help to turn off the further Process. If switch didn't turn off within 15 seconds the Program in a background will start running. GPRS will take the current location after 15 seconds and will forward the message to Controller. The all-programming code will be saved in the controller in which the controller will take location from GPRS Module and design the message as readable format with location link. This format will be sent to the selected contact in database with the help of 4G Module. The block diagram of the working of this entire process is explained as follows:

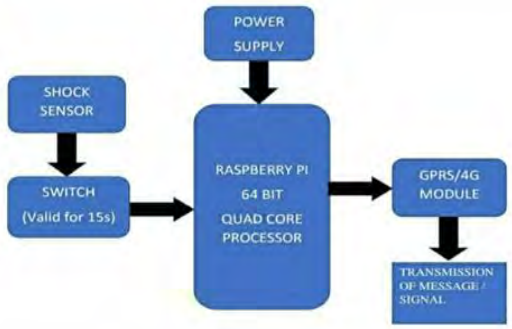


Fig.5 Block Diagram

IV. DESIGNING MODEL

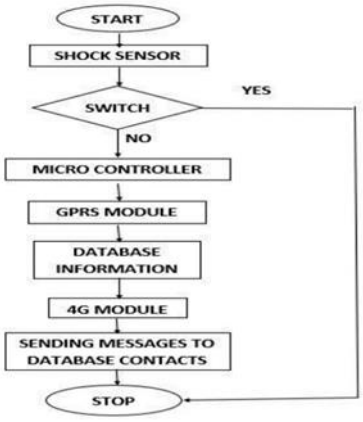


Fig 6 flowchart

Fig 6 flowchart

The Sensor will help to Triggered the Switch. Switch will help to turn off the further Process. If switch didn't turn off within 15 seconds the Program in a background will start running. GPRS will take the current location after 15 seconds and will forward the message to Controller. The all-programming code will be saved in the controller in which the controller will take location from GPRS Module and design the message as readable format with location link. This format will be sent to the selected contact in database with the help of 4G Module.

V. LITERATURE SURVEY

1. Adriver safety system consisting of an emergency switch that will send the car's Scorodites with a "HELP" message to the nearest control room when pressed. Since dangerous gases and suspended particulate matter can cause adverse effects on the driver, the use of gas sensors to track the air quality inside the vehicle. In the event that any dangerous gases are detected, this device may be used to warn the driver. Further testing and calibration to make the device acceptable for the roads in India
2. If the accident has happened, the automatic system is used. The system provides latitude and longitude without delay to the location of the system accident. It is possible to save more human lives using this automated method.
3. If the driver does not hold firmly on the steering wheel, this device is not successful, resulting in a large number of frequent alarms. Whereas, due to the use of infrared sensors, the suggested device can detect driver drowsiness even if the driver does not hold tightly on the steering wheel. The proposed system uses a non-intrusive technique to detect the heart rate by embedding the infrared pulse rate sensor array on the steering wheel, which does not require driver cooperation for the system to work effectively
4. While the proposal has been built to be simple, durable, easy to use, and flexible, some known challenges still exist. The adaptation of A-GPS technology is some of the challenges that could be resolved. This suggests that the GPS location will be a satellite triangulation mix, but it would also use cell phone towers as a location point.

VI. APPLICATIONS

1. Stolen vehicle recovery: The location and recovery of the vehicle is possible with the aid of RF id when the vehicle is stolen.
2. Group management: With the aid of the MCU unit, a group or a particular type of vehicle may be handled.
3. Asset monitoring: A very big benefit is the tracking of the vehicle in real time
4. On Transition Device Tracking: The tracking system is so activated when the vehicle moves from one position to another.

.

VII. RESULTS

The proposed framework discusses accident alerting and detection with the implementation of the system mentioned in this paper. The center of the system is Arduino, which helps to pass the message to various devices in the system. If an accident happens, the vibration sensor will be triggered and the information will be transmitted to the registered number through the GSM module. Using GPS, the position can be sent to cover the geographical coordinates around the region through the tracking device. A vibration sensor that is used as a main module in the device will classify the accident.

VIII. FUTURE SCOPE

The proposed framework deals with accident detection. But this can be extended by supplying the patients at the accident site with treatment. We can also prevent accidents by developing technology by supplying warning systems that can stop the car from overcoming accidents

ACKNOWLEDGMENT

This project cannot be generated by a person entirely. Due to our instructor and project guide, Mrs. Leena Chakraborty (Electronics Department), who provided us with guidance and encouragement during its development, the timely completion of the project 'Real Time Car Accident Warning System' was possible. We are grateful to her for giving us the chance to create this project. We are also grateful to our parents for offering all available tools to learn the best information possible. Finally, we would like to thank our 'Thakur College of Engineering and Technology' college for providing us with a forum for this project and the requisite facilities.

REFERENCES

[1] .R.S GAONKAR Microprocessor architecture programming and Application" WILEY EASTERN LTD, NEWDELHI
[2] .KRISHNA KANT "Microprocessor and microcontroller" EASTERN COMPANY EDITION NEW DELHI 2007
[3] .DANIEL .W.LEWIS "Fundamental of embedded software "prenticeHall of India.
[4] .WILLIAM STALLING "Wireless communication and Networks", 2nd edition, 2005 prentice hall of India
[5] .Wineyard Technologies, "Automatic Vehicle Accident Detection and Messaging System using GPS and GPRS
[6] .Asirt.org. (n.d.). Road Crash Statistics. [online] Available at: http://asirt.org/Initiatives/Informing-Road-Users/Road-Safety-Facts/Road-Crash-Statistics [Accessed 10 Dec. 2017].
[7] . R.S GAONKAR Microprocessor architecture programming and Application" WILEY EASTERN LTD, NEWDELHI
[8] . KRISHNA KANT "Microprocessor and microcontroller" EASTERN COMPANY EDITION NEW DELHI 2007

This page is kept blank intentionally

Android Phone Operated Home Appliances Using Bluetooth Technology

Vivek Goswami
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharahtra
vivekgg85@gmail.com

Agrima Gupta Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharahtra
agrima.gupta2312@gmail.com

Dhruvik Dankhara
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharahtra
dhruvikdankhara@gmail.com

Sukruti Kaulgud
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharashtra
sukruti.kaulgud@thakureducati on.org

***Abstract*— Saving energy to save the planet takes effort, the effort to turn the lights OFF while leaving the room or the effort for turning OFF the TV on the second floor when you are downstairs. This saves manual energy but leads to wastage of electrical energy. But there is a solution for saving both of them. The new smart home management system turns the lights and fans ON/OFF automatically depending upon the presence in the room, it can happen manually or remotely through smartphone. Household appliances can be toggled with smartphone. This system comes with an extra benefit of security. You can set up cameras anywhere in or around the house and watch the live footage on smartphone. This system reduces the effort for saving energy and money by reducing overall electricity consumptions by giving the freedom for system customisation.**

Keywords—Automation, Bluetooth, Wi-Fi, IoT, appliances, microcontroller, sensors, surveillance, efficiency, customization.

I. INTRODUCTION

Everything is getting smarter with technology, homes are no different. Forgetting to turn OFF appliances, your home will do it for you. Worrying about somebody breaking into your home it will look after that too. Upgrading homes with smartphone operated automation system for ease of use, customisation and protection along with saving more energy.

In [1] a web-based home automation system was designed, implemented and tested. Once the user decides to use the remote monitoring and control activities via the World Wide Web, he/she can enable the remote access software engine to allow remote access via the server's parallel port to monitor and control the appliances from any web bower a web-based automation system was designed, implemented and tested. The appliances can be monitored using a standalone embedded system or remotely via World Wide Web with internet access. In [2] User will control this system using an Android App. When user opens the App, he/she will be presented with two options – Bluetooth or Online. If the user is within short range of the system, Bluetooth option can be selected. If the user is far away from the system or outside the home, he/she can select the online option. In [3], this paper showed shrewd home computerization idea utilizing minimal effort Arduino board for controlling different electrical apparatuses utilizing an Android PDA. Giving special IP locations to associated gadgets and protection and security in a keen home condition is another enormous test. As IOT manages immense measure of Information gathered from different sensors sent in a shrewd domain, legitimate care ought to be grasped in taking care of, putting away and securing the information.

In [4], this mechanism uses the transmission of serial data through Bluetooth. Bluetooth controller application is to transmit serial data wirelessly via Bluetooth. User just need to define a specific character that must be sent which will serve the purpose. For the character 'B' (for bulb) the Bluetooth module decodes the character into its binary form (i.e. in terms of 1 and 0).In [5], all the information will be transmitted over the cloud to the user. Whenever any unusual activity is noticed the user will be notified by the system. The load can be controlled and monitored using a web page or android app with user configurable front end. A CCTV is mounted in front of door. If someone rings the bell and no one is at home, depending on user's choice a picture from the CCTV or a live video feed can be sent to the user via the application or display it on our web app. In [6], a new screen can be added in the Designer by clicking on "Add Screen" Suppose user named the screen "Home Screen". Then add a button on it called "Home Button". Click ON Home Button, use the 'open another screen' block to swap to screen1. Similar mechanism can be provided on screen1 to swap to home screen. When the SMS button or Internet button is pressed then the corresponding control screen is opened. SMS mode is in the screen 2 and the Internet mode is in the screen 3. In [7], This method allows users to use their smartphone to scan the electric device with his or her camera and then process from the camera to select the fixed IP object and after processing the image, applications will now request that the image be viewed on the Visual Cloud API or LCD and authentication, the user will now control the devices connected to the Arduino processor. In [8], Li-Fi technology for communication between the connected devices, and uses WVSN as system for surveillance. All devices are connected to each other and to the internet via Li-Fi and controlled by a user interface from

anywhere and at any time using cloud computing In [9], A very secured application was created where the user requires the pairing password for Arduino BT and cell phone to control the devices.
In this paper through the proposed system, user will be able to know current temperature using temperature sensor and fans can be controlled depending upon the status of sensors. When the user is out of the home, door security will be ensured using password or fingerprint locking system Photo sensors or Light sensors will AUTO ON and OFF lights. This project is feasible as cost will be less than other projects.
In section [II], proposed methodology has been discussed. In section [III], the expected output of the system has been described. Conclusion is presented in section [IV] followed by future scope in section [V]

II. PROPOSED METHODOLOGY

A. Design

In proposed design, a smartphone application will be developed through which user can control the devices. It will consist of separate buttons for each devices to toggle them according to the needs of the user. A microcontroller will be used which will play an important role as it will be programmed to control devices. Bluetooth/Wi-Fi modules will serve as mode of communication between smartphone and microcontroller. The system will require sensors like temperature sensors, PIR sensors, ambient light sensors to capture the data and send it to the microcontroller. Relays will be connected to the microcontroller, they will operate as electrical switches in the circuit to make the mains supply possible to the appliances. The system will have an energy efficient design which will reduce cost after the installation and durable design to minimize maintenance cost.

For security, Cameras will be linked to the smartphone application for monitoring and live footages. Also for fingerprint verification system LCD display, Keypad will be required.

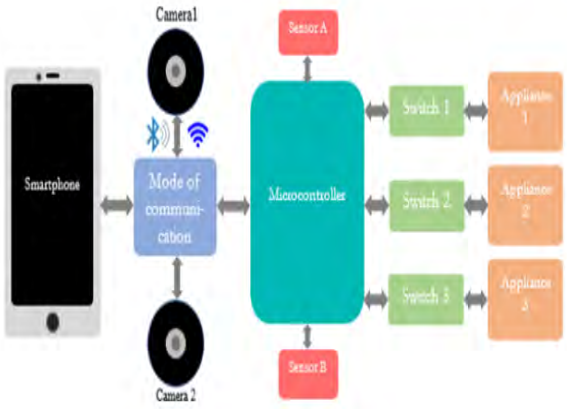


Figure 1: Proposed methodology

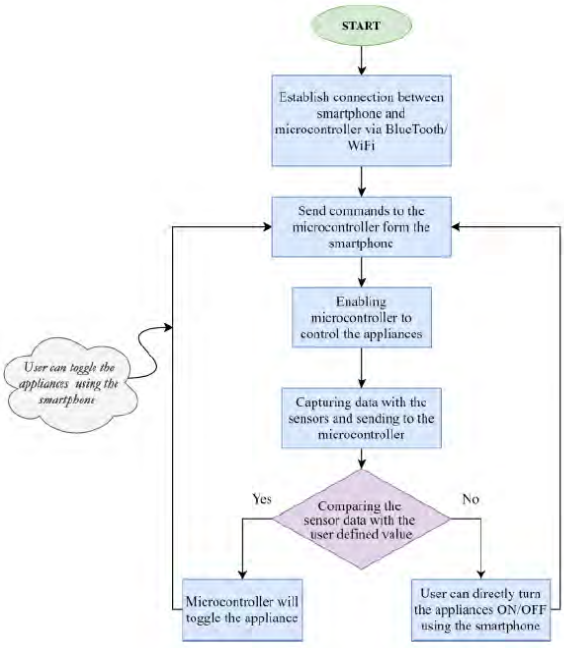


Figure 2: Flowchart for appliance control

B. Controlling devices

The user will be able to control the household appliances using smartphone. The smartphone will send the commands to the microcontroller and the microcontroller will toggle the appliances. The sensor connected to the microcontroller will send the sensed data to the microcontroller and it will decide to turn ON/OFF the appliances based on the predefined threshold value. For example, when the temperature sensor detects the ambient temperature and send the numeric value to the microcontroller the microcontroller will compare the temperature value with the predefined temperature level. It the ambient temperature is higher than the set value the microcontroller will turn the fans or air coolers ON. Similarly, if the ambient temperature gets lower than the set value the microcontroller will turn OFF the fans and air coolers. The same appliance toggling process takes places with various other sensors like ambient light sensor or motion sensors.

C. Security

For the security purposes the cameras will be connected to the microcontrollers which will allow the user to monitor and view the live footage of the cameras on the smartphone. The number of cameras depend upon the user requirements. Also providing an extra layer of security by developing a password verification system. The user can enter a password which is suitable to their needs. The entered password will be checked with the predefined password. If the password is correct the LCD will display a message “Door open” otherwise in case of wrong password the a message of “Wrong password “ will be displayed on the LCD. The application will get notified if the password is wrong and also live recordings van be viewed.

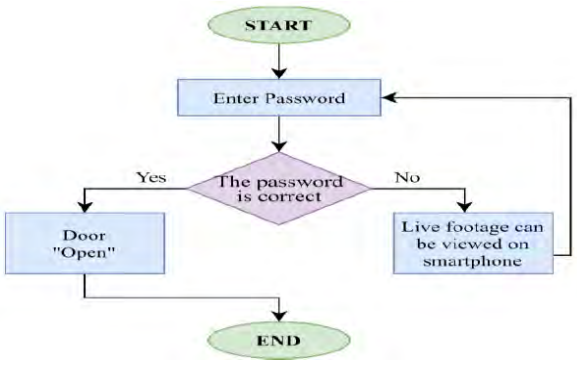


Figure 3: Flowchart for Security

III. EXPECTED RESULT

Lights and fans will turn ON/OFF depending on the presence of a person in the room. Timers will be set for mosquito repellents to turn on automatically in the evening and turning OFF in the daytime when the house is unoccupied. It will be intelligent enough to control certain appliances according to the status of the sensors. The user will have complete access over the system and providing various customisations. Devices like TV, refrigerator, electric kettle, mobile chargers will be controlled using WIFI/Bluetooth and smartphone application. An extra layer of security will be provided at the main gate of the house by installing password or fingerprint protected lock. Live recordings of the door step can be observed through smartphone application.
The system will ensure energy consumption as it will be controlled either by the sensors or the user can directly control the devices. The system will be cost effective and will be feasible enough so that everybody can operate. The system will provide customization and comfort to the user as it reduces manual exertion. Security can be assured with cameras and password verification system.

IV. CONCLUSION

This system will control the devices automatically and reduce power consumption. The microcontroller will take care of most of the task and will also allow the users to control the system if they want. Manual involvement gets minimized as different sensors sense the required data and makes the system intelligent enough to control the appliances. The system offers a dedicated socket for mosquito repellants that automatically turn ON during evening and OFF when the house is vacant or during the daytime. The system allows the user to customize all the settings and can also control all the appliances manually as per their choice. The system intelligence reduces energy consumption by making it energy efficient and cost effective. The system ensures home security and surveillance. Live recording of the door step can be viewed, providing a complete assurance when not at home.

V. FUTURE SCOPE

More appliances can be added to system and further reducing the human efforts of manual operation. Making the system more compatible with device and involving more features than just switching of appliances. Information can be stored on the Cloud which can make the retrieval of the data possible from anywhere in the world. Live recordings can be accessed easily. Curtain motions can be controlled offering a complete customization. For security enhancement alarms can be added to the system to detect and unusual activity around or inside the house. This system is proposed for home but later on it can be installed at offices, restaurants, etc. as the technology flourishes. The system can be made more and more affordable with time as technology advances and system requirements get cheaper.

REFERENCES

[1] A.R.Al-Ali, M.AL-Rousan,"Java based Home Automation System", IEEE Transactions on Consumer Electronics, Vol. 50, No. 2, May 2004

[2] Amar Pawar, Rahul Sharan, Rahul Patil,Sandip Chavan , "Home Automation using Bluetooth and IOT " , IJIRCCE, Vol. 6, Issue 2, February 2018

[3] M.Abivandhana , K.Divya , D.Gayathri , R.RuhinKouser, "Smart Home Automation Based on IOT and Android Technology ", International Journal of Engineering Science and Computing, March 2017

[4] Ronauk Kumar Maharana, "Android Phone Operated Home Appliances Using Bluetooth Technology", International Journal of Scientific & Engineering Research, Volume 6, Issue 9, September-2015

[5] Saurabh Singh, Harjeet Matharu & Dr. Sangeeta Mishra , "Internet of things(IOT) based home automation system ", International Journal of Engineering Sciences & Research Technology, ISSN: 2277-9655, November, 2017

[6] T.Rajesh, R.Rahul, M.Malligarjun, M.Suvathi, "Home Automation Using Smartphone Application", An International Journal of Engineering & Technology 22, Volume 4, Number 4, April, 2017

[7] Devendra Kumar, Rajesh Kumar Maurya, Kalpana Dwivedi," IoT Based Home Automation using Computer Vision" , International Journal of Innovative Technology and Exploring Engineering (IJITEE), Volume-8 Issue-12, October 2019

[8] Mosaif Afaf, Rakrak Said " Smart home based on Li-Fi" , International Workshop in Information and Communication Technologies for a Smart City, May 2018

[9] R.Piyare, M.Tazil, "Bluetooth based home automation system" , International Research Journal of Engineering and Technology, Volume: 05 Issue: 10 , Oct 2018

[10] Prof.H.B.Shinde, Abhay Chaudhari, Prafull Chaure, Mayur Chandgude Pratik Waghmare , "Smart Home Automation System using Android Application" , International Research Journal of Engineering and Technology , Volume: 04 ,Apr -2017

[11] Kannapiran S, Dr. Arvind Chakrapani , "A Novel Home Automation System using Bluetooth and Arduino " , Internationalournal of Advances in Computer and Electronics Engineering , Volume: 02 February 2017

[12] G.Mahalakshmi, M.Vigneshwaran," IOT Based Home Automation Using Arduino ",International Journal of Engineering and Advanced Research Technology , Volume-3, August 2017

[13] Naresh Kumar Assistant Professor, MSIT, New Delhi, India , "Economical Home Automation System using Arduino UNO" , Advances in Computational Sciences and Technology , Volume 10, Number 6 (2017)

This page is kept blank intentionally

IOT Based Temperature and Humidity Monitoring System Using Arduino

Karan Salunkhe
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
k.salunkhe222@gmail.com

Akhilesh Shelke
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
akhileshshelke10@gmail.com

Mayank Sharma
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
mayanksharma9371@gmail.com

***Abstract*— In the era of technology advancement, everything requires monitoring and controlling. This paper proposes an IoT framework for facilitating food monitoring for protection of the food, so that it would not get contaminated due to surrounding conditions during storage and transportation. In present scenario, the work done is in terms of the sensed value that have been recorded and a detailed analysis has been performed but automated controlled alternatives are not present. The proposed solution analyzes temperature, moisture, light as these parameters affect nutritional values of food items such as fruits and vegetables, and makes the analysis results accessible to the user via a mobile application (SMS).**

A web server is used for storage of data values sensed in real time and also for analysis of results. User is alerted via messages along with locations of the shipment whenever an emergency occurs in this solutions, heterogeneous sensors for various domains are employed for sensing the condition of food.

Keywords—Food monitoring, IoT, Sensor

I. INTRODUCTION

Food is the main energy source for the living being; as such food quality and safety have been in the highest demand throughout the human history. Internet of things (IoT) is a technology vision to connect anything at anytime and anywhere. Utilizing IoT in the food supply chain (FSC) enhances the quality of life by tracing and tracking the food condition and live sharing the obtained data with the consumers or the FSC supervisors. Currently, full application of IoT in the FSC is still in the developing stage
and there is a big gap for improvements. Food safety and hygiene is a major concern in order to prevent food wastage. The quality of food needs to be monitored and it must be prevented from routing and decaying atmospheric factors like temperature, humidity and darkness Therefore, it is useful to deploy quality monitoring devices at food stores. These quality

monitoring devices keep a watch on the environmental factors that cause or pace up decay of the food. Later, the environmental factors can be controlled like by refrigeration, vacuum storage etc.,

A food contamination can occur in the production process, but also a large part caused by the inefficient food handling because of inappropriate ambient conditions when the food is being transported and stored. There are many factors leading to food poisoning, typically changes in temperature and humidity are important factors. So, the monitoring system capable of measuring temperature and humidity variability during transport and storage is of prime importance. Today almost everybody is getting effected by the food they consume, it's not only about the junk food, but all the packed foods, products consumed and used in daily life, as all of them do not offer quality since their temperature, moisture, oxygen content vary from time to time. Majority of consumers only pay attention to the information provided on the packaging, i.e., the amount of ingredients used and their nutritional value, but they forget that they are blindly risking their health by ignoring the environmental conditions to which these packets are subjected to them. To ensure food safety, it should be monitored at every stage of supply chain.

The job of a control and monitoring systems is to keep an eye on particular thing or activity and to make sure that it stays in the desired manner. Monitoring can be achieved using various electronic sensors. Further these recorded values can be used for the purpose of controlling. The data obtained from sensors can be compared to the desired values. If the sensor readings are found to be unequal to the desired values then the control circuit will come into action to manipulate the assigned activity to keep it in desired manner. We suggest use of this principle for building a system which can preserve raw foods. Smart food monitoring system is aimed to monitor and control food materials and prevent it from damages occurring due to atmospheric or climatic changes.

II. LITERATURE SURVEY

Lately, IoT has emerged as an area which has gained immense interest of both venture capitalists and tech giants, resulting in a plethora of research activities and

business initiatives. Some of the applications which have garnered attention include smart grid, smart city, smart wearable devices and smart home. Almost all of the various IoT applications involve some kind of sensors and transducers normally attached to a microcontroller along with wired or wireless transmission to either a local database or a remote cloud which transforms raw data into useful information which can be effectively utilized. The research and development activities comprise techniques of fabrication of smart objects or devices, suitable wireless technologies, development boards, designing network protocols, applications and much more. In the context of our project, we explored recent work accomplished in the development of useful and interesting applications using low cost development boards such as Raspberry Pi and Arduino. Some of the popular applications developed using these boards include home automation, patient monitoring systems and weather and environmental monitoring systems.

In [1], temperature, humidity, light intensity, gas leakage, sea level and rain intensity are measured and the data are sent wirelessly to ThingSpeak using Arduino UNO. This work focuses considerably on MATLAB visualization and analysis. Authors in [2] monitored and controlled environmental conditions like temperature, relative humidity, light intensity and CO2 level using sensors and LPC2148 microcontroller. The data was sent to ThingSpeak cloud. In comparison with LPC2148, Arduino UNO used in our system is simple, low cost and less complex for a simple application. Authors in [3] present an IoT based real-time weather monitoring system using Raspberry Pi which is complex compared to Arduino due to Python language and Raspbian operating system. An Arduino based weather monitoring system is developed and presented in [4]. Authors imported data from multiple sensors to excel which is cumbersome when compared to ThingSpeak. Authors in [5] designed and developed a wireless sensor network system for environmental monitoring using Raspberry Pi and Arduino. They employed Xbee module to implement the IEEE 802.15.4 standard for data collection from multiple sensor nodes at a base station (Raspberry Pi). Their system can be extended to suit large scale applications, however in the present form, the system lacks cloud connectivity.

III. PROPOSED METHODOLOGY

A. WORKING PRINCIPLE-

We have wireless sensor unit to monitor the critical environmental parameters like temperature, humidity, light, moisture etc. we have DHT-11 sensor which will senses the humidity and temperature at shopping mall and give it to the Arduino. Arduino will convert this analog vale into digital value compared threshold value. If the parameter above or below the threshold value then actuators will turn on and control the temperature. Alarm will be on to turn on. We have gas sensor which will send message to owner. We have IR sensor unit, which is used to monitor the stock. If the stock is less it will sense and send information to the vendor. (Automatic ordering system). We have GSM to communicate with vendor and owner. We have EPS-8266(wi-fi) module which is used to upload all measured data into the cloud. We use Thing speak cloud, which is freely available for students. Which will collect the sent data and plot the graph. We can take daily /weekly/monthly report for data analysis. We have LCD display, which displays the status of each sensor.

Fig1. Block diagram of proposed system.

B) IMPLEMENTATION-

IoT device should be installed in a food store. Once it is properly installed and powered on, it connects with the internet via Wi-Fi modem and start reading data from the interfaced sensorsDHT-11 temperature and humidity sensor and LDR sensor. DHT11 temperature and humidity sensor is a digital sensor with inbuilt capacitive humidity sensor and thermistor it relays a Realtime temperature and humidity reading every 2 seconds. The sensors operators on 3.5 to 5.5 V supply and can read temperature between 0 degree C and 50 degree C and relative humidity between 20% and 95%.

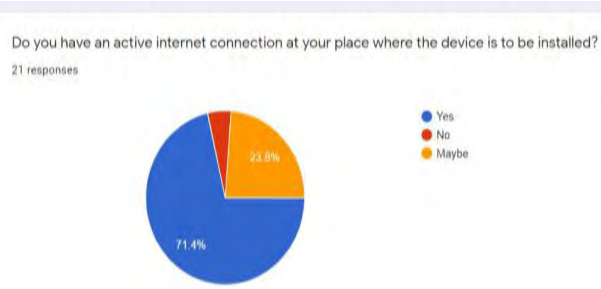
Sensor cannot be directly interfaced to a digital pin of the board as it operates on 1-wire protocol which must be implemented only on the firmware. The first data pin is configured to input and a start signal is sent to it. The start signal comprises of a LOW for 18 milliseconds followed by a HIGH for 20 to 40 microseconds followed by a LOW again for 80 microseconds and a HIGH for 80 microseconds. After sending the start signal, the pin is configured to digital output and 40-bit data comprising of the temperature and humidity reading is latched out. Of the 5-byte data, the first two bytes are integer and decimal part of reading for relative humidity respectively, third and fourth bytes are integer and decimal part of reading for temperature and last one is checksum byte.

The LDR sensor is connected in a potential divider circuit and inputs a voltage at the analog input pin of the controller. The voltage is read and digitized using in-built ADC channel. The Arduino collects data from all the sensors and convert the values to the strings. The sensor data wrapped as proper strings are passed to the character LCD for display. The ESP8266 Wi-Fi module connected to the Arduino uploads the data to Cloud Server. For displaying and monitoring data uploaded to the Cloud server, the analog output is passed to the analog pin of the Arduino which has inbuilt ADC that coverts the analog to digital value. Today's smart devices peripherals are becoming more integrated and play an important part of our computing experience and also offers the convenience of wireless connectivity, selection the sensor typically depends on balancing high performance against design complexity and board space, balancing ease of use against design complexity and cost, balancing high functionality against low-power consumption, cost savings and low space requirements.

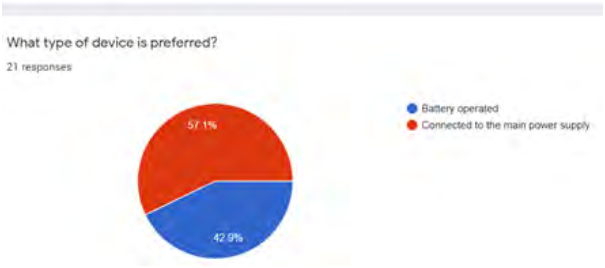
We have wireless sensor unit to monitor the critical environmental parameters like temperature, humidity, light, moisture etc. we have DHT-11 sensor which will senses the humidity and temperature at shopping mall and give it to the Arduino. Arduino will convert this analog vale into digital value compared threshold value. If the parameter above or below the threshold value then actuators will turn on and control the temperature. Alarm will be on to turn on. We have gas sensor which will send message to owner. We have IR sensor unit, which is used to monitor the stock. If the stock is less it will sense and send information to the vendor. (Automatic ordering system).
We have GSM to communicate with vendor and owner. We have EPS-8266(wi-fi) module which is used to upload all measured data into the cloud. We use Thing speak cloud, which is freely available for students. Which will collect the sent data and plot the graph. We can take daily /weekly/monthly report for data analysis. We have LCD display, which displays the status of each sensor LDR Sensor - The LDR is used to sense the intensity of light. The sensor is connected to the A1 pin of the Arduino board. The sensor is connected in a potential divider circuit.

IV. RESULT FORM SURVEY

It is always expected that the proposed system is multi-functional. It is observed that 81% of the users need a system which could detect temperature as well as



The proposed system will detect the readings and display live readings to the user, for this purpose it is important that an active internet connectivity is available, the following question was asked to concern whether the user is knowledgeable about the internet connectivity. According to the survey 71.4% users were already having an active internet connection, 23.8% users had an internet connection but was not an active one.



For the convenience purpose it is important that the system should be designed according to the end users. The following question concludes that 57.1% users need a system which is connected to the main power supply.

For easy accessibility of data, it is important that the data to be accessed has multiple platforms. The following question was proposed to know, on which platform does the user expect to access the data. 52.4% of the users are willing to get the readings on both website as well as on an app.

V. CONCLUSION

As the system is to be designed according to the need of the market a survey was conducted on what type of system is needed and what price range is expected for the system. It is clearly observed that the user needs a system which is convenient, which could sense both temperature and humidity. The user expects the system should be connected to main power supply and the reason is durability of the sensing system. The user is ready to opt for an active internet connection which is necessary for the system to transfer the data. For the accessibility purpose the user feels more comfortable with both web application as well as an android app. The user is willing to install the system in the indoors as well as outdoors hence the sensitivity and accuracy of the system should be appropriate. The price range expected is
between 1500-2000RS with a monthly maintenance cost of 200-300RS.

REFERENCES

[1] S. Pasha, "ThingSpeak based sensing and monitoring system", International Journal of New Technology and Research, Vol. 2, No. 6, pp. 19-23, 2016

[2] K. S. S. Ram, A. N. P. S. Gupta, "IoT based data logger system for weather monitoring using wireless sensor networks", International Journal of Engineering Trends and Technology, Vol. 32, No. 2, pp. 71-75, 2016

[3] S. D. Shewale, S. N. Gaikwad, "An IoT based real-time weather monitoring system using Raspberry Pi", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering", Vol. 6, No. 6, pp. 4242-4249, 2017

[4] R. Ayyappadas, A. K. Kavitha, S. M. Praveena, R. M. S. Parvathi, "Design and implementation of weather monitoring system using wireless communication", Vol. 5, No. 5, pp. 1-7, 2017

[5] S. Ferdoush, X. Li, "Wireless sensor network system design using Raspberry Pi and Arduino for environmental monitoring application", Procedia Computer Science, Vol. 34, pp. 103-110, 2014

[6] Arduino, Arduino Uno Rev 3 Overview, available at: https://store.arduino.cc/arduino-uno-rev3

[7] https://thingspeak.com

[8] https://developer.android.com

[9] ZHIBO PANG, QIANG CHEN, WEILI HAN, LIRONG ZHENG, "Value-Centric Design of the Internet-of-Things Solutions for Food Supply Chain", Procedia Computer Science , Vol. 3, No. 3, pp. 1-6, 2012

Blood Oxygen and Heart Beat Monitor

Paridhi Sureka
E&TC
Thakur College of Engineering and Technology
Mumbai, India
surekaparidhi@gmail.com

Sonal Rao
E&TC
Thakur College of Engineering and Technology
Mumbai, India
jeppusonal@gmail.com

Srishti Pandey
E&TC
Thakur College of Engineering and Technology
Mumbai, India
srishti18200@gmail.com

Sonia Behra
E&TC
Thakur College of Engineering and Technology
Mumbai, India

***Abstract*— The project deals with the use of technology in healthcare that is gaining importance as a result of the tendency to acquire chronic disease like heart attack and high blood pressure. Heart rate and blood oxygen saturation are a couple of such biometrics that are monitored in this project to provide information regarding the health of the body. The purpose is to examine how heart rate and the oxygen saturation of subject is measured from finger and then processed and displayed. The design, is small in size, easy to use, allows a non-invasive, real time method to provide information regarding health. This enables an efficient and economical means for managing the health care.**

Keywords: Heart rate and blood oxygen, high blood pressure, pulse oximeter, heart-rate monitoring device

I. INTRODUCTION

Measurement of heart rate and pulse oximetry are very important factors to access the condition of human cardiovascular system. An optical heart rate sensor measures pulse waves, which are changes in the volume of a blood vessel that occur when the heart pumps blood. The heartbeat sensor is based on the principle of photoplethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ (avascular region). The flow of blood volume is decided by the rate of heart pulses and since light is absorbed by the blood, the signal pulses are equivalent to the heartbeat pulses.

A pulse oximeter is a small, lightweight device used to monitor the amount of oxygen carried in the body. This noninvasive tool attaches painlessly to your fingertip, sending two wavelengths of light through the finger to measure your pulse rate and how much oxygen is in your system. In this project, we are intended to design a system that monitors the heart-beat and checks the bloodoxygen level simultaneously using pulse oximeter system.

II. LITERATURE SURVEY

A. Heart Rate Monitoring System

According to the analysis done by the Author, Heart Rate can be monitored in two ways: one way is to manually check the pulse either at wrists or neck and the other way is to use a Heartbeat Sensor. Pulse oximetry is used in this project to detect the heartbeat using fingers. This study used both hardware and software component. The highlighted Hardware components are The fingertip sensor, Intel MCS-51 Microcontroller (8051), along with other components. The software includes coding of the microcontroller.[1]

B. Pulse oximeter-based monitoring system for people at risk

The authors purposed a low-cost mobile monitoring and alerting device, which communicate with a personal computer located in the range of a wireless or Bluetooth network and automatic analyze and record data into database for later review. the authors presented hardware and software structure of the system, operation theory, implementing costs, power consumption and experimental results involving adult persons.[2].

C. An Overview On Heart Rate Monitoring And Pulse Oximeter System

The author's purpose for proposing this project is to examine how heart rate and the oxygen saturation of subject is measured from finger and then processed and displayed. The design, is small in size, easy to use, allows a non-invasive, real time method to provide information regarding health. This enables an efficient and economical means for managing the health care.[3].

III. SWOC ANALYSIS

IV. FLOWCHART

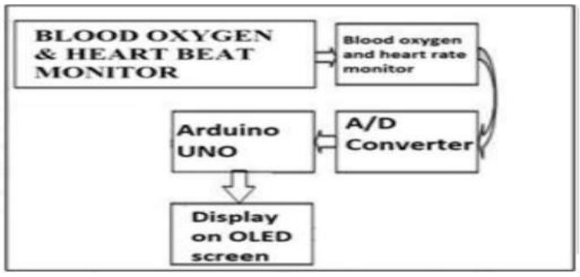
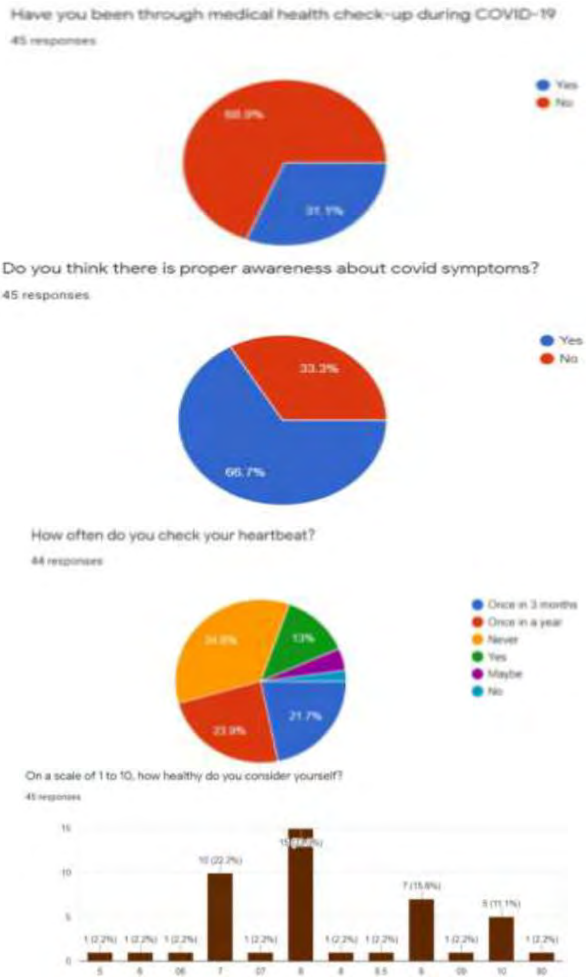


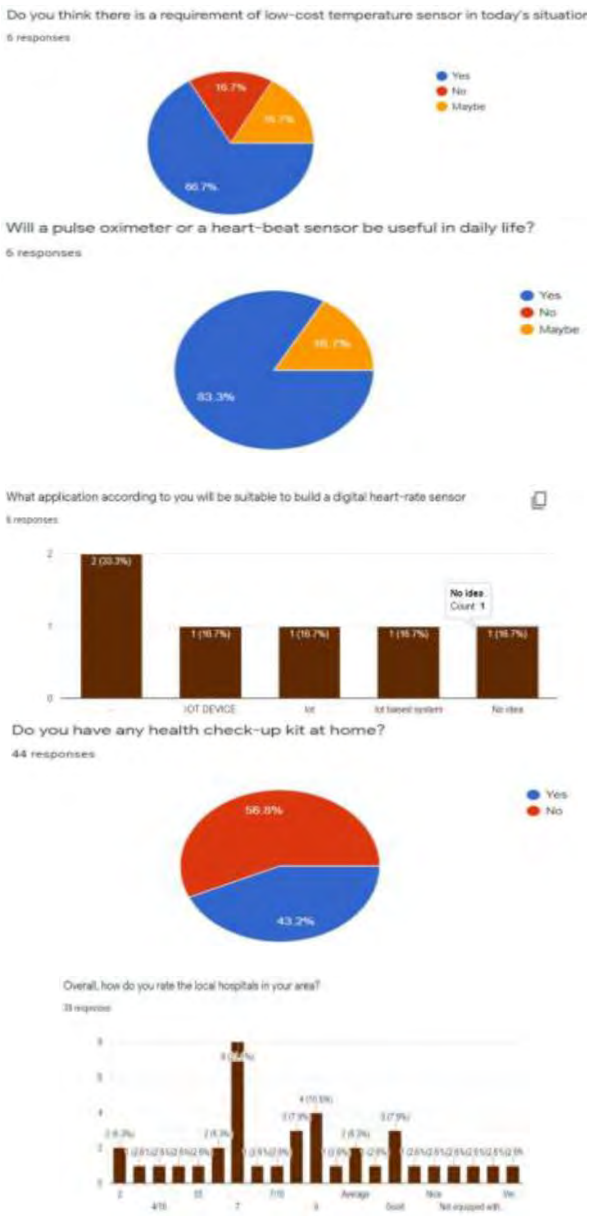
Fig 1: flowchart for blood oxygen & heartbeat monitor

V. DESIGN

To design a system that monitors the heartbeat and checks the blood-oxygen level using pulse oximeter. We intended to make the model using both hardware and software technology. The hardware technology includes the circuit connections of the Arduino system and the overall implementation, and the software technology consists of the development of the app, GSM Technology and coding system of the Arduino. The further implementation procedures include a touchless temperature sensor and a contactless sanitizer dispenser model as well. This model can be used by anyone entering any premises that consists many people leading to risk of spreading the infection.

VI. RESULT & STATISTICS





VII. CONCLUSION

Using the blood oxygen & heart beat monitor with just one touch of fingertip, the person can get the blood oxygen level and heart beats per minute on the OLED screen. It will also detect the safe range of the pulse rates. It will not require any extra manual efforts to check the symptoms by making it a completely userfriendly device. We have discussed about the monitoring of heart rate which can be calculated within a fraction of seconds. ARDUINO software for programming purpose and output will be shown in hardware part. This hardware is easy to handle and quite
simple in its connections

REFERENCES

Esrat Jahan, Tilottoma Barua, Umme Salma, "AN OVERVIEW ON HEART RATE MONITORING AND PULSE OXIMETER SYSTEM", International Journal of Latest Research in Science and Technology Volume 3, Issue 5: Page No 148-152. September-October 2014.

Artificial Clinician Using IoT For Health Monitoring System

Niwash Yadav
Electronics and telecommunication
Thakur College of engineering and technology
Mumbai,India
niwashyadav8@gmail.com

Sachin Yadav
Electronics and telecommunication
Thakur College of engineering and technology
Mumbai,India
sachinyad987@gmail.com

Ujjval Maurya
Electronics and telecommunication
Thakur College of engineering and technology
Mumbai,India
ujjvalmaurya64@gmail.com

Mrs. Kalawati Patil
Electronics and telecommunication
Thakur College of engineering and technology
Mumbai,India
kalawati.patil@thakureducation.org

***Abstract* — Health is the level of useful and metabolic potency. The Diseases cause millions of deaths worldwide because of the increase in population and the rising of healthcare costs. There is also a demand for quality healthcare from remote locations Technological advancements in the field of medical electronics and communication can help decrease the cost of healthcare. Doctors and relatives of patients can monitor the patient remotely through the Internet. It uses remote sensing to keep track of certain parameters like heartbeat, temperature and acceleration. As a result, doctors can provide quick services from remote places or in case monitored by the guardian, he can take necessary steps to save the patient's life immediately through the email or SMS notification that they receive. This project will propose a health monitoring system which is capable of detecting multiple parameters of our body such as blood pressure, temperature, heart rate. A continuous record of body health parameters can be used to detect the disease in a more efficient manner.**

Keywords — Temperature Sensor, Heart Beat Sensor, Humidity Sensor, IoT Sensor,Motion Sensor, Smart Health Monitoring.

I. INTRODUCTION

Late years have seen a rising enthusiasm for wearable sensors and today a few gadgets are industrially accessible for individual human services, fitness, and movement speed. Not the specialty recreational fitness field taken into account by ebb and flow gadgets, analysts have additionally considered uses of such advancements in clinical applications in remote wellbeing checking frameworks for long haul recording, administration and clinical access to patient's physiological data Long waiting time for hospitalization or ambulatory patient monitoring/treatment, are other well-known issues for both the healthcare institutions and the patients. This project will be providing healthcare authorities to maximize the quality of healthcare services by controlling costs. As the population increases and demand for services increases, the ability to maintain the quality and availability of care, while effectively managing financial and human resources, will be achieved by this project. The use of modern communication technology in this context is the sole decisive factor that will be making such communication systems successful.

Designing a Remote Patient Health Monitoring System which has heart beat detection system, temperature detection system, a humidity detection system. A doctor or health specialist can use the system to monitor remotely all vital health parameters of the patient or person of interest. An attempt at designing a remote healthcare system made with locally available components. The Heartbeat, Temperature, Humidity, Blood Pressure, ECG. This all- parameter data will be transmitted to the microcontroller and the data will be collected transmitted to a receiver module. The detected analog signal will then be digitized to give a digital value readable on the LCD. Simple cloud server will be hosted with a database for all the vital data to be accessed remotely whenever required.

However, wearable sensors have, up to this point, had little influence on the current clinical routine with regards to medication. In this paper, we concentrate especially on the clinical field and look at the open doors managed by accessible and up and coming advances and the difficulties that must be tended to with a specific end goal to permit incorporation of these into the act of solution

II. LITERATURE REVIEW

Improvement in Technology and miniaturization of sensors, there have been attempts to utilize the new technology in various areas to improve the quality of human life. One main area of research that has seen an adoption of the technology is the healthcare sector. The people in need of healthcare services find it very expensive this is particularly true in developing countries.This is an attempt to solve a healthcare problem currently society is facing. The main objective of the project was to design a remote healthcare system With the rapid growth of the elderly population, there is a need to support the ability of elders to maintain an independent and healthy lifestyle in their homes rather than through more expensive and isolated care facilities. One approach to accomplish these objectives employs the concepts of ambient intelligence to

remotely monitor an elder's activities and condition. The patients' health conditions such as the body and excretion weight in the toilet, the ECG during taking the bath and the pulse and respiration rate during sleeping were successfully monitored. [1]

Improvement in technology and miniaturization of sensors, there have been attempts to utilize the new technology in various areas to improve the quality of human life. One main area of research that has seen an adoption of the technology is the healthcare sector.

The people in need of healthcare services find it very expensive this is particularly true in developing countries.This is an attempt to solve a healthcare problem currently society is facing. The main objective of the project was to design a remote healthcare system. The System being disease specific instead of patient specific, which is ideally desired custom sensor platforms that perform data collection and preprocessing and that are equipped with accelerometer

.To reduce the data mining to study the graph of patient for common disease. [2]

Improvement in technology and miniaturization of sensors, there have been attempts to utilize the new technology in various areas to improve the quality of human life. One main area of research that has seen an adoption of the technology is the healthcare sector. The people in need of healthcare services find it very expensive this is particularly true in developing countries. This is an attempt to solve a healthcare problem currently society is facing. The main objective of the project was to design a remote healthcare system. The System is not secured as it contains vital information of the patient. This system uses AES cryptography as it has low power Consumption, low process time, low latency, high throughput and the most important is it security and privacy maintaining method. The strength or security of 128 bit key for AES is same as 256 bit key of ECC. [3]

Meanwhile, the use of IoT technology in applications has spurred the increase of real-time data, which makes the information storage and accessing more difficult and challenging. In this analysis, first a semantic data model is proposed to store and interpret IoT data. Then a resource-based data accessing method is designed to take and process IoT data ubiquitously to improve the accessibility to IoT data resources. Finally, we present an IoT-based system for urgent medical services to demonstrate how to collect, integrate, and interpret IoT data flexibly in order to provide support to emergency medical services. [4]

Healthcare applications for the IoT can potentially deliver comprehensive patients care in different settings, including acute (in-hospitals), long-term (nursing homes), and community-based (in-homes). An IoT has the potential to accurately track people, equipment, supplies, service animals and analyze the data which is captured by devices (sensor/camera). Sensors attached to patients to measure vital signs and other bio-metric information, problems could be more rapidly diagnosed, a better quality of care given and resources used more efficiently. [5]

The Internet of Things has been widely used to interconnect the available medical resources and offer smart, reliable, and effective health care service to the elderly people. Health monitoring for active and assisted living is one of the paradigms that can use the IoT advantage to improve the old lifestyle. In our proposed system, we present an IoT architecture, customized for healthcare applications. The proposed architecture collects the data and relays it to the cloud where it is processed and analyzed. Feedback actions of data based on analysis can be sent back to the user. [6]

III. GAP IDENTIFICATION

The data, consisting medical history of many patients' parameters and corresponding results, can be explored using data mining, in search of consistent patterns and systematic relationships in the disease. For instance, if a patient's health parameters are changing in the same pattern as those of a previous patient in the database, the consequences can also be estimated. If the similar patterns are found repeatedly, it would be easier for the doctors.

The main disadvantage is the users have to wear the proposed belt. But if users want to safe there life this issue have to bear, this board is a compressed version of the Arduino board. There are less number of pins in WEMOS board compared to the Arduino. Moreover using accelerometer sensor fall detection functionality can also added.

IV. PROPOSED METHODOLOGY

In this project Human Body Temperature, Blood Pressure Humidity and Heart Rate readings which are monitored using System and this is shown as Fig 1. These sensors signals are send to System via amplifier circuit and signal conditioning unit, because the signals level are low (gain),so amplifier circuit is used to gain up the signal and transmit the signals to the System. System is a operating system works as a small pc processor system. Here the patient Body Temperature, Blood Pressure, Humidity and Heart Rate is measured using respective sensors and it can be monitored in the screen of computer using System as well as monitoring. The proposed method of patient monitoring system monitors patient's health parameters using System.

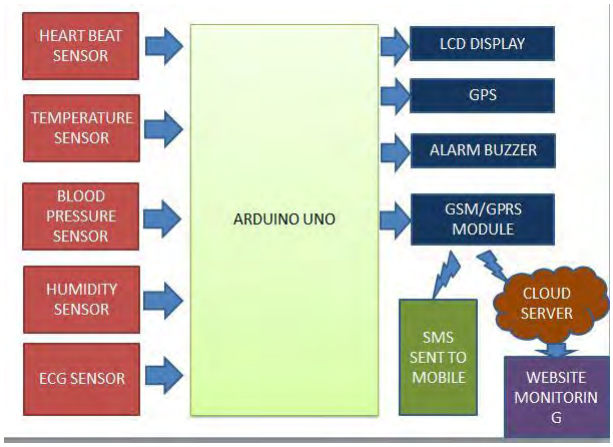


Fig 1: Block Diagram of Health Monitoring System.

After connecting internet to the system it acts as a server. Then the server automatically sends data to the website. Using IP address anybody can monitor the patient's health status anywhere in the world using laptops, tablets and smart phones. If these parameters goes abnormal it will automatically sends alert SMS as well as email to the doctors and relatives. This system includes sensors, control board, server & web application problems such as high fever, heartbeat issue, blood pressure issue, humidity level, ECG will be detected. Including lcd display for displaying the data and alarm buzzer for alert warning. Data averaging algorithms will be used to average and store the data on the server. Regularities will be noted and if similarity is identified a notification will be sent through the Alert messaging system.

V. SIMULATION STEPS

Step 1: Open Proteus software and select new design in File menu.

Step 2: A dialogue box appears to save the current design. However, for creating a new design file so you can click Yes or No depending on the content of the present file. Then a Pop up appears asking to select the template. It is similar to selecting the paper size while printing. For now select the default or according to the layout size of the circuit.

Step 3: An untitled design sheet will be opened, save it according to your wish, it is better to create a new folder for every layout as it generates other files supporting your design. However, it is not mandatory.

Step 4: To select components, Click on the component mode button.

Step 5: Click on Pick from Libraries. It shows the categories of components available and a search option to enter the part name.

Step 6: Select the components from categories or type the part name in Keywords text box.

Step 7: The selected components will appear in the devices list. Select the component and place it in the design sheet by left-click.

VI. RESULT

Interfacing of LM35 Temperature Sensor with Arduino to design a Digital Thermometer.The measured temperature will be directly displayed on a 16*2 LCD. LM35 is capable of reading the temperature in Centigrade scale. The output voltage of the sensor is directly proportional to the temperature in centigrade. LM35 can be used in the range of -55°C to +150°C. The circuit design for the Arduino based heart rate monitor system using heart beat Sensor is very simple. First, in order to display the heartbeat readings in bpm, we have to connect a 16×2 LCD Display to the Arduino UNO. Place any finger (except the Thumb) in the sensor clip and push the switch (button). Based on the data from the sensor, Arduino calculates the heart rate and displays the heartbeat in bpm. A PIR sensor is generally known to the world as a motion sensor or motion detector. Here we are going to sense movement of human by using Passive infrared sensor (PIR sensor).

1.1 Interfacing Temperature Sensor with Arduino UNO

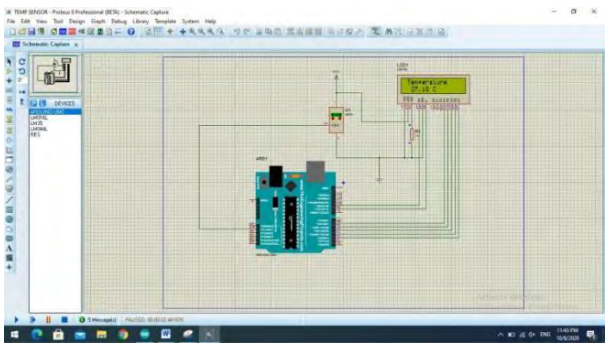


Fig 2: Interfacing Temperature Sensor with Arduino UNO

In this project, we interfaced LM35 Temperature Sensor with Arduino to design a digital thermometer. The measured temperature will be directly displayed on a 16*2 LCD. LM35DZ is capable of reading the temperature in Centigrade scale. The output voltage of the sensor is directly proportional to the temperature in centigrade. LM35 can be used in the range of -55°C to +150°C.

1.2 Interfacing Heart Beat Sensor with Arduino UNO

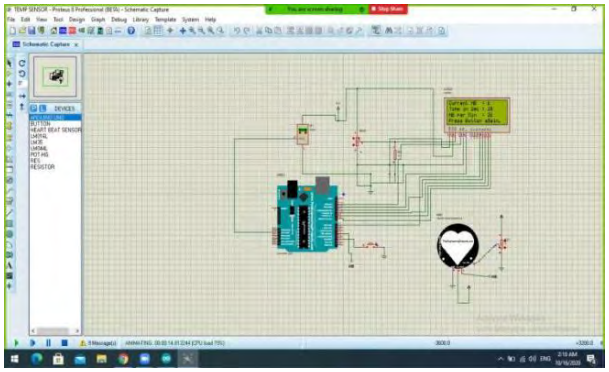


Fig 3: Interfacing Heart Beat Sensor with Arduino UNO

The circuit design of Arduino based Heart rate monitor system using Heart beat Sensor is very simple. First, in order to display the heartbeat readings in bpm, we have to connect a 16×2 LCD Display to the Arduino UNO. Place any finger (except the Thumb) in the sensor clip and push the switch (button). Based on the data from the sensor, Arduino calculates the heart rate and displays the heartbeat in bpm.

1.3 Interfacing Motion Sensor with Arduino UNO

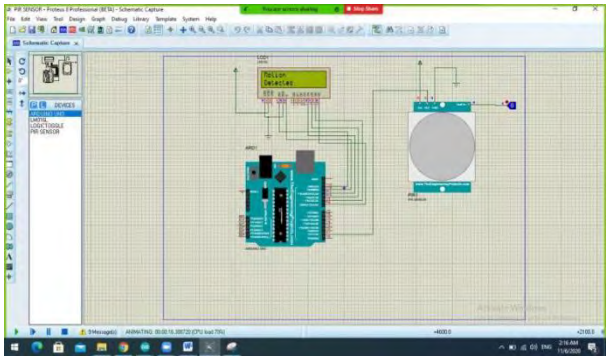


Fig 4: Interfacing Motion Sensor with Arduino UNO

A PIR sensor is generally known to the world as a motion sensor or motion detector. Here PIR Sensor will sense the movement of human body using Passive Infrared Sensor. If it is 0 then Motion Detected If it is 1 then Motion Not Detected.

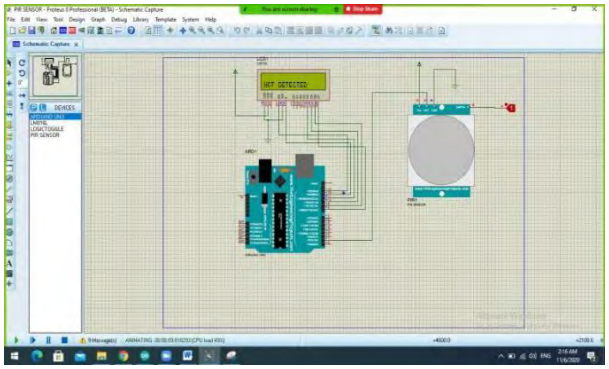


Fig 5: Interfacing Motion Sensor with Arduino UNO A. Benefits and Impacts:

In terms of scalability, the system can be duplicated in terms of convenience, health analysis can be performed at home and distance problems can be solved. The system design is lightweight, Portable and wearable. The creation of this system meets the specification of iot, transforming the current healthcare system using IoT technology. The IoT devices like temperature device (LM3), Wireless force per unit area Monitor, and Heartbeat monitor are connected to the body of the patient to create the BAN. The devices sense the information from the patient's body and send them to the native system through the wireless device devices. Mobile application is intended for the good thing about doctors and patients. The health standing of the patient is updated within the application for each sixty seconds once the update within the server. Data collected from the IoT devices to the system is large and therefore the information will be viewed on websites. All parameters will be viewed through the web application anyplace any time sample knowledge is collected to observe the patient's health. The web application is accessed by doctors through their username and positive identification.

The doctors will read all the small print related to their patients data re-collective of temperature, vital sign, etc. It is updated within the server for each sixty second. To obtain the real time medical information about a patient via IoT .

To Process and classify the information gathered about the patient. To interpret and predict any disease or disorder in the preliminary stage itself using the data mining techniques that will also provide the approach advantageous for decision making. Motivation behind choosing this project is due to the effect of covid-19 on people related to health. Even Doctors are afraid because of this Coronavirus. So currently they are avoiding touching people. Because of that many senior citizens and other people are facing problems.So this project come into existence which will test vital parameters of health like Human body temperature, Heartbeat & Motion sensor etc.

VII. CONCLUSION

The increasing rate of chronic diseases in the aging population is becoming a serious concern due to lack of sufficient facilities and extremely high cost. The situation is even worse for the people residing in remote areas far from medical facilities as delay in diagnosis and treatment may lead to death. Timely diagnosis and treatment can solve these issues to a great extent. The Secured Health Monitoring System that remotely monitors parameters like Body Temperature, Heart-rate. The system will be cost-effective due to the use of Arduino and low-cost sensors. The system will be established for home use by patients who are not in a life-Threatening situation. It will provide real-time alerts to concerned people and medical professionals.

This will improve the overall health of people worldwide. In general, IoT based health care platforms which connect with smart sensors attach with the human body for health monitoring for daily checkup. In this paper we discussed an IoT based patient monitoring system. The system technologies being used by smart phone or gadgets in the present time where it also mentioned advantages, challenges and opportunities. Due to the importance of observing medical patients, continuous remote monitoring is necessary.

VIII. FUTURE SCOPE

According to the availability of sensors or development in biomedical trend more parameter can be sensed and monitored which will drastically improve the efficiency of the wireless monitoring system in biomedical field. A graphical LCD can be used to display a graph of rate of change of health parameters over time. The whole health monitoring system which we have framed can be integrated into a small compact unit as small as a cell phone or a wrist watch. This will help the patients to easily carry this device with them wherever they go. In addition, with medical application we can use our system in industrial and agricultural application by using sensors like humidity sensors, etc.

REFERENCES

[1] T. S. Barger, D. E. Brown and M. Alwan,"Health-status monitoring through analysis of behavioral patterns", IEEE Transactions on Systems, Man, and Cybernetics - Part A: Systems and Humans, 5(1):22–27, Jan 2005 ISSN 1083-4427.

[2] Xu, L. D. Xu, H. Cai, C. Xie, J. Hu, and F. Bu. "Ubiquitous data accessing method in IoT-based information system for emergency medical services" ,IEEE Transactions on Industrial Informatics,10(2):1578– 1586, May 2014 ISSN 1551-3203.

[3] S. H. Almotiri, M. A. Khan, and M.A. Alghamdi, "Mobile health (m-health) system in the context of IOT",In 2016 IEEE 4th International Conference on Future Internet of Things and Cloud Workshops (FiCloudW), Aug 2016.

[4]ShubhamBanka,Isha Madanand S.S. Saranya, "International Journal of Applied Engineering Research Volume 13", Number 15 (2018) pp. 11984-11989 ISSN 0973-4562.

[5] Alexandros Pantelopoulosand NikolaosG. Bourbakis,"IEEE Transaction on System, Man and Cybernetics-Part C: Application And Reviews", Vol.40,
No. 1, Jan 2010.

[6] Nikhil Nair R, Kiran K A "International ConferenceOn Intelligent Computing and Control Systems",ICIC CS2017.

This page is kept blank intentionally

Wireless Mobile Battery Charger Circuits

Vinanti Rao
Electronics and Telecommunication
Thakur College of Engineering& Technology
Mumbai, India
vinantirao214@gmail.com

Abstract: **Emerging technologies are making our life simpler these days. With the introduction of mobile phones, life has changed rapidly. This is a dream of radio engineering. Mobile phones merged land line telephone systems. These days, many advancements in the mobile phones were introduced. These advancements provide many services such as text, internet etc. But although there are many advancements in the technology, we still rely on the wired battery chargers. Each phone will have its own designed battery charger. Thus, the battery chargers are required to carry everywhere to keep the battery backup. Now just think of a battery charger that charges you're mobile automatically. When you sit for tea and place your mobile on the table, it simply charges you're mobile. This article explains a simple wireless battery charger circuit that charges your mobile when placed near the transmitter. This circuit may be used as wireless power transfer circuit, wireless mobile charger circuit, wireless battery charger circuit, etc.**

Keywords— Wireless Mobile Charging Vehicle, Optimization, Routing path, Adaptive Decision System, Scalability, Wireless energy transfer, Wireless Sensor Network.

I. INTRODUCTION

Today, electricity plays a vital role in our modern-day life. As everyone are using many numbers of appliances using electricity, it is quite difficult to live without electricity. Traditionally wires or cables are used to carry the electrical power from one place to another. However, Wireless Power Transmission (WPT) has emerged as the technology in the recent days, where the electrical power is transmitted from one place to another without the use of wires. The main theme behind WPT is to get rid of the risky usage of the wires at the same time to eliminate the difficulty in organizing the power cords. For an example, the portable electronic devices including mobile phones, tablets, laptops, household robots, drones and etc. normally relies upon the battery power. Due to the rapid development and tremendous applications, these portable devices are becoming part of our day-to-day activities. In addition to that, there is always an increasing demand of smart gadgets to say good bye to wires, making capable of charging without being plugged in. Hence, there is a necessity for finding a new technology to be free of from the clumsy cables or the chargers.

II. LITERATURE SURVEY

For better comprehension theories related to Magnetic Resonant Coupling, quality factor and optimization techniques for wireless power transfer systems are presented here along with the working principles and constructions of various components. Magnetic coupling is an old and well understood method in the field of wireless power transfer. But as the magnetic field decay very quickly, magnetic field is effective only at a very short distance. By applying resonance with in magnetic coupling the power transfer at a greater distance can be obtained. For near field wireless power transfer, Magnetic resonant coupling can be the most effective method than any other method available. The block diagram for the whole experiment is shown below. It is consisting of an AC source, rectifier, oscillator, transmitter, secondary sources and load coil. It is observed that the voltage of 220V is connected to the transformer. The transformer is then connected to the transmitter circuit as a source of supply. William C. Brown has designed, developed a unit and demonstrated to show how power can be transferred through free space by microwaves. In the transmission side, the microwave power source generates microwave power and the output power is controlled by electronic control circuits.

III. METHODOLOGY

The proposed system architecture consists of two sections namely transmitter and receiver sections. Table 1 illustrates the hardware requirements for our proposed work.

Hardware Requirements:

1 Transmitter Section

Figure 1 shows the transmitter section which starts with an input AC supply of 230V. Then step-down transformer is used for reducing the input voltage. Actually, step down transformer converts the 230V AC supply into 12V AC supply. Then, the bridge rectifier converts the AC supply to DC supply. Reason for using bridge rectifier is that we need only DC supply for charging the mobile. Next, the voltage regulator is used for reducing the repulsion in DC supply. Finally, the DC supply is transferred to the transmitter coil. The

wireless power transmitting coil would create an alternating magnetic field in the coil due to induction, to transmit energy.

2 Receiver Section

Receiver section consists of receiver coil. The AC current from the receiver coil is admitted for rectification and filters to convert AC into DC. Then, the DC supply is admitted to the DC regulator (7812) to change the DC supply to 12V DC. Next, the 12V DC is applied as an input to the PIC 16F877A.Then the output is connected to the mobile adapter. Since we are obtaining very low DC supply, a mobile adapter is used. Using that adapter, mobile phone is admitted to the charging.

Software Implementation:

1) ISIS Simulation

In ISIS simulation, the transmitter circuit is used to check the connections. Here, an input voltage of 12V is given, where the output value of 4.7V is obtained.

WORKING:

In our Wireless charging system there are two circuits, a transmitter circuit and a receiver circuit.

The transmitter circuit consists of step down transformer of 230/12V. This transformer steps down 230V AC from main supply to 12V AC. Then that 12V AC is converted into 12V DC with the help of bridge rectifier. After that a 2200/25V capacitor is used to filter the ripples and pure DC is supplied. Then the oscillator circuit oscillates at 10MHz and with the help of transmitting coil it transmits the wireless power.

The receiver circuit receives the power through receiving coil and passes through voltage multiplier circuit (consisting of diode and capacitor voltage multiplier) and through that voltage the mobile charging is achieved.

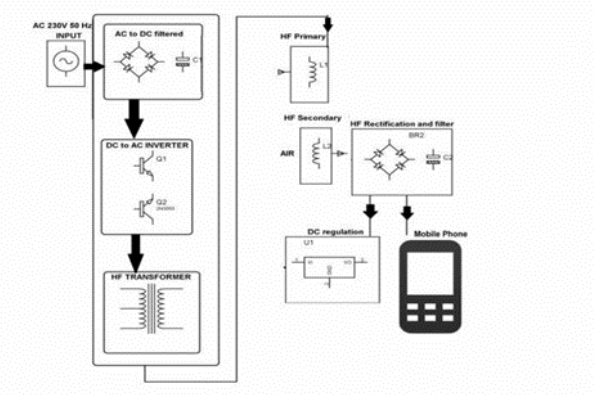


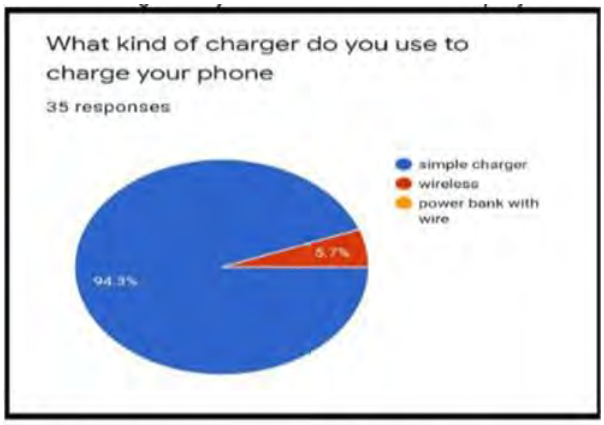
Fig 1: Block Diagram Of wireless mobile phone battery charger

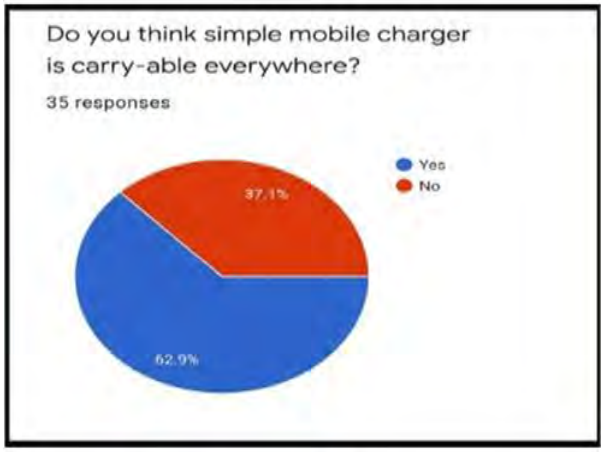
IV.RESULT

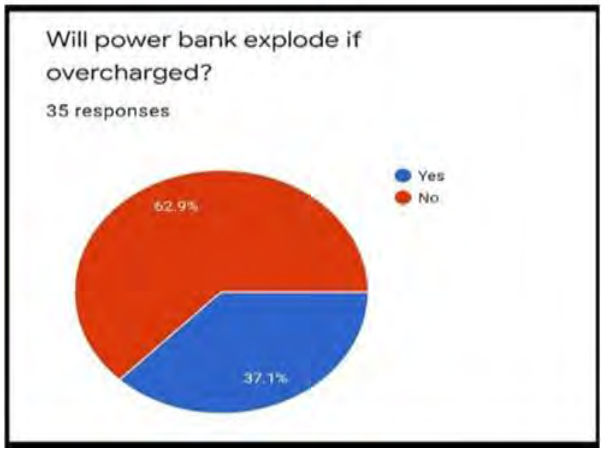
In future Usage of separate charger is eliminated. Phone can be charged anywhere and anytime. It does not require wire for charging. Easier than plug into power cable therefore there is an urgent requirement of a system for the easy use of wireless power charging. In future we look for better improved methodologies, more automation and more user-friendly application on this system and we hope that this system will be applied to vehicles and every other possible battery based electronic system.

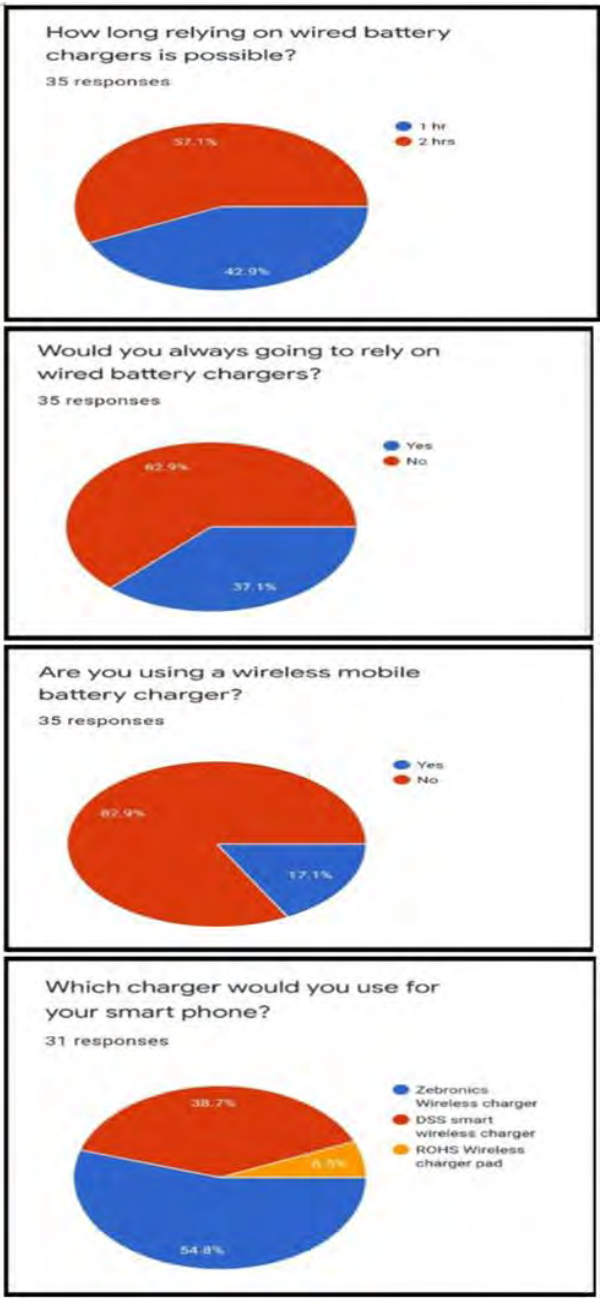
V. SURVEY

The following survey was conducted for our project.









V. CONCLUSION

Wireless battery charging has many advantages in terms of convenience because users simply need to place the device requiring power onto a mat or other surface to allow the wireless charging to take place. We believe that our contribution in this work will successfully benefit society in terms of convenience, reduced wear of plugs and sockets, and application in medical environments. Reduced efficiency is one of the key challenges in wireless battery charging system due to resistive losses on the coil, stray coupling and etc.

VI. FUTURE SCOPE

Future trends in wireless charging are anticipated to be based around dynamic electric charging, which allows phones to get charged while in motion. The technology could drastically improve the when the person is traveling on roads etc.

REFERENCES

[1] Xiao Lu, Niyato, D, Ping Wang, Dong In Kim, Zhu Han, "Wireless charger networking for mobile devices: fundamentals, standards, and applications", IEEE Wireless Communications, Vol. 22, No. 2, pp. 126 – 135, April 2015.

[2] Siqi Li , Mi, C.C., "Wireless Power Transfer for Electric Vehicle Applications", IEEE Journal of Emerging and Selected Topics inPower Electronics, Vol. 3 , No.1, pp. 4 – 17, April 2014.

[3] Olvitz, L , Vinko D, Svedek T, "Wireless power transfer for mobile phone charging device", Proc. 35th IEEE International Convention MIPRO, pp. 141 – 145, May 2012.

[4] Tsunekawa K, "A feasibility study of wireless power tran smissionsystem by using two independent coupled electric fields", IEEEMTT-S International Microwave Workshop Series on Innovative Wireless Power Transmission: Technologies, Systems, andApplications (IMWS), pp. 141 – 144, May 2011.

[5] Shubham Chaturvedi, Er. Sudhanshu Tripathi, "Modelling & Analysis of High-Power, High-Frequency Wireless Power Transmission", International Research Journal of Engineering and Technology (IRJET), Vol. 04, No. 05, pp. 2732- 2737, May 2017.

[6] Md. Saifuddin, Tushar Saha, Monirul Islam, Md. Mujammel Hossain Akhand, Ebad Zahir, "Wireless Power Transmission Compare and Contrast with the Form of Resonance Frequency, Mutual Inductance and Solar Energy, International Journal of Engineering Research andApplication, Vol. 4, No. 10 (Version 6), pp.66-96, October 2014.

[7] Keerthana.R, Pragadeshwar.A.M, "Wireless Mobile to Mobile Charge Transfer Using WPT Technology", International Journal of Advanced Research in Computer Science Engineering and Information Technology, Vol. 4, No. 3, Special Issue: 3, pp. 984-990, April, 2016.

[8] Jitendra Sharma, Kavita Jain, Muralidhar Jangid, Rakesh Prajapat, Shubham Sharma, Pradeep Yadav, Nikhil Gupta, "International Journal of Engineering and Management Research", Vol. 6, No. 2, pp. 248-251, March-April 2016.

[9] Mohamed A. Hassan, A.Elzawawi, "Wireless Power Transfer through Inductive Coupling", Recent Advances in Circuits, pp. 115-118, 2015.

[10] Vithyaa. M, Marthandan. R, "Wireless Power Transmission for Mobile and Vehicle", IOSR Journal of Electronics and Communication Engineering (IOSR-JECE), Vol. 9, No. 1, Ver. VI, pp. 50-52, Feb. 2014.

This page is kept blank intentionally

Automated Health Care System for Pregnant Woman through Primary Health Centre using IoT and Machine Learning Techniques

J.Preetha
Deparment of Computer Science and Enginnering
Muthayammal Engineering College(Autonomous) Rasipuram, India
psgpreetha@gmail.com

V.Karuppuchamy
Deparment of Computer Science and Enginnering
Muthayammal Engineering College(Autonomous) Rasipuram, India
karuppuchamy89@gmail.com

R.Kavishree
Deparment of Computer Science and Enginnering
Muthayammal Engineering College(Autonomous) Rasipuram,
kavishree1911@gmail.com

M.Ramya
Deparment of Computer Science and Enginnering
Muthayammal Engineering College(Autonomous) Rasipuram, India
ramyamani.tms@gmail.com

K.Vijay
Deparment of Computer Science and Enginnering
Muthayammal Engineering College(Autonomous) Rasipuram, India
romanvijay094@gmail.com

N.Subashini
Deparment of Computer Science and Enginnering
Muthayammal Engineering College(Autonomous) Rasipuram, India
subanatarajan2000@gmail.com

***Abstract* —Tele Health Caring system is closely linked to Medical Informatics which is infancy in India. It may encompass all spheres of health care in future. E-Health care is an emerging field in the intersection of Medical Informatics, Public Health and Business, referring to health services and information delivered or enhanced through internet and the Mobile technologies which is widely used today. Corporate health care is hearing into fast track growth using latest technology to provide best quality of service to the public. Government has announced lot of schemes in health care sector for the beneficial of public and these schemes are effectively implemented by the health ministry of state government**

Keywords — Machine Learning, IoT, Health Centre, Medical Informatics, Primary Health Centre (PHC), Personal Digital Assistant (PDA), Demographic, Weka tool Survey

I. INTRODUCTION

Each village is equipped with primary health centre where doctors are deputed and these health centers are in turn linked to district level health centre. District level health center is located in Government Hospital of a district. Government hospitals in district are linked with Government hospital located at State Capital.

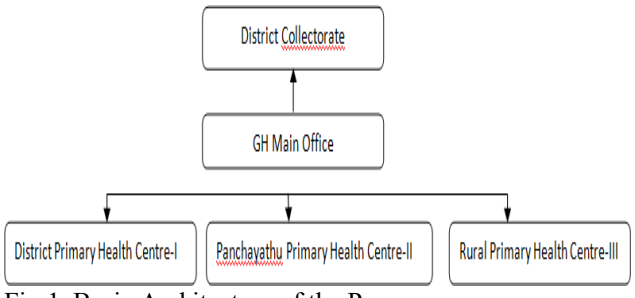


Fig.1. Basic Architecture of the Process

The project suggested in this work "E- Health care System for Pregnant Woman in Primary Health Centre" can be effectively implemented in all primary health centre since these centre are connected with district and state level through network. We will get all the information
immediately. Patient record has been created after the successful patient registration. The following patient related information is stored for ready reference

1.Patient details
2.Demographic details
3.Doctors appointment schedule
4.Laboratory/Radiology/Cardiology reports

The entire primary health centers are equipped with internet connectivity and this application can be developed as a web based application. The details of the patients are collected at the time of their admission as an outpatient. Otherwise, hand held mobile computing devices like Personal Digital Assistants (PDAs) is being provided to Primary Health Centre (PHC). The workers of PHC often visit the patient's home and collect the data using the PDA in the villages or remote places. The collected data is transferred from PDA to the desktop in PHC. The data compilation and report.

II.RELATED WORKS

Health Car Monitoring

Maternal deaths are detrimental to social development and wellbeing, as some 1 million children are left motherless each year. These children are more likely to die within 1-2 years of their mothers' death. Women need not die in childbirth. This may be avoid by give a young woman the information and support she needs to control her reproductive health, help her through a pregnancy, and care for her and her newborn well into childhood. The vast majority of maternal deaths could be prevented if women had access to quality family planning services, skilled care during pregnancy, childbirth and after delivery, or post-abortion care services and where permissible, safe abortion services.

The pregnant woman details are shortlisted from Primary Health Care Centre and this application is used to track the health conditions of each pregnant woman.

The patients details are updated when every time their visit to PHC.
Five direct complications account for most of maternal deaths:
•Hemorrhage
•Infection
•Unsafe abortion
•Eclampsia (very high blood pressure leading to seizures)
•Obstructed labor.
More than that the following reasons are the main causes of maternal death such as
•Unavailable of Medical facility
•Inaccessible
•Unaffordable or poor quality care is fundamentally responsible.
This application is a caring system, may give useful information and suggestion in a timely manner through alert messages and give necessary support to the pregnant woman. The follow-up of each month for pregnant woman such as generation can be possible at the PHC level, District level and State level.
The application suggested is a monitoring system for pregnant woman. Monitoring of individual pregnant woman for health care was not possible earlier. The pregnancy & Health care tips can be given to the beneficiary through our system as an SMS in their native language or demonstration video through social network such as face book or WhatsApp. The application also consists of the facility to call the doctor immediately.
Complications for Maternal Deaths
•Hemorrhage
•Infection
•Unsafe abortion
•Eclampsia (very high blood pressure leading to seizures)
•Obstructed labor.
More than that the following reasons are the main causes of maternal death such as
•Unavailable of Medical facility
•Inaccessible
•Unaffordable or poor-quality care is fundamentally responsible.
This application is a caring system, may give useful information and suggestion in a timely manner through alert messages and give necessary support to the pregnant woman. The follow-up of each month for pregnant woman such as the diet to follow, vaccination reminder, day today drugs as an SMS alert in their native language. The demonstration videos related to pregnant woman health care will be sent to them through social network such as face book and WhatsApp. By this way our application software will give support to the woman and the time they are connected with PHC. In case of any emergency, immediately bring the attention of PHC.
The above facility is not available as of now and all the patient details are maintaining in manual basis.

Problems of Peoples Residing in Rural
In our country, most of the population is residing in villages which is located in rural areas. Totally 60 percentage of our population living in villages. Providing Primary Health Centre(PHC) in all part of the country is difficult and deputing Doctors for all the areas is also a tedious process.
This project is mainly designed for the pregnant woman residing in rural/remote areas, especially in hill areas.

III. SCOPE OF THIS PROJECT

1.The project proposed in this work " E- Health care System for Pregnant Woman in Primary Health Centre" is an effective way of collecting ,maintaining and tracking the woman health care in rural/remote areas.
2.This project is mainly aimed at providing better healthcare facility for patients living in rural/remote areas.

IV. TECHNOLOGY PLATFORM AND ARCHITECTURE

Software Requirements:
•Client: Mobile App with Android OS
•Server: Java with My-Sql
•Software Tools : Weka tool for Data Mining Hardware Requirements:
•Notebook Computers
•PC with Core i3 processor , 2 GB RAM and 320 GB HDD

System Architecture
The overall system architecture is shown in figure 4. It consists of the following components.
•Mobile phone with android operating system (Client)
•Data Centre, implemented using My-sql. (Server)

The data related to pregnant woman health condition is collected through notebook computers and sent to centralized database linked with primary health centre (PHC), Government Hospital database and State Level Database. The process flow diagram of the proposed system is shown in figure 5. "E-Health Tracking" system collects the data from the centralized database and sends SMS alert to patients giving reminders about their health check up/vaccination remainder, emergency services etc and sending useful information to pregnant woman through social network
PHC: Primary Health Centre
GH: Government Hospital

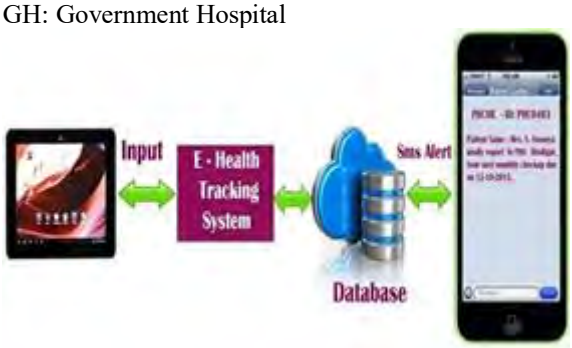


Fig.2. Overall System Architecture

Fig.3. Process Flow Diagrams

V. METHODOLOGY

Data mining is the practice of automatically searching large stores of data to discover patterns and trends that go beyond simple analysis that is extracting of interesting patterns or knowledge from huge amount of data. Data mining uses sophisticated mathematical algorithms to segment the data and evaluate the probability of future actions. Data mining is also known as Knowledge Discovery in Data (KDD). Big data is a popular term used to describe the exponential growth and availability of data, both structured and unstructured. Big data is also refers to data sets or combinations of data sets whose size (volume), complexity (variability) and rate of growth (velocity) make them difficult to be captured, managed, processed or analyzed by conventional technologies and tools, such as relational databases and desktop statistics or visualization packages, within the time necessary to make them useful. And big data may be as important to business and society as the Internet has become.

Big data is enlarged in many advanced domains because of rapid growth in networking and data collection. The proposed "e-health Tracking System" uses big data to store patient information. The main objective is to provide control over all the views of data related to patient. The analysis of result will be generated using association rule mining techniques processed from big data of "e-health Tracking system". The results from mining techniques could be evaluated in terms of accuracy, precision, recall and positive rate.

The work commences with capturing the input data of patient through notebook computers. The captured data will be sent to "e-health Tracking System" for processing. Big data is used to store patient information in centralized database. The proposed "e-health Tracking system" after getting the input data monitors the health condition of the pregnant woman and sends SMS alert such as their checkup due date, lab reports, reminder of vaccination and health tips.

Basic functionalities of the proposed system consist of the following steps:

•Patient data entry
•Database Maintenance
•Information Sharing
•Health Care Monitoring
•Mining Technique Implementation

Patient Data Entry

The first step in the proposed approach is to capture patient data using notebook computers/tab as shown in figure 6. The data will be then sent to "e-health Tracking System" through database for processing.

Fig.4.Patient Data Entry through Notebook Computers

Database Maintenance

This phase is used to store the data in database. The collected data is used to monitor the health conditions of patient.

Information Sharing

Information sharing describes the exchange of data between various Primary Health Centres (PHCs). This phase provides easy access of patient information between PHCs by sharing their medical records. To design and develop application software for maintaining the complete health record of a Pregnant Woman.

This application software enables tele-monitoring of the patient effectively and gives reminder for health check up and vaccination. This application software allows the patient to contact in case of emergency and get the attention of doctors immediately. Supply of smart phone with Mobile App loaded for the patients.

The diet to follow, vaccination reminder, day today drugs as an SMS alert in their native language. The demonstration videos related to pregnant woman health care will be sent to them through social network such as face book and WhatsApp.

By this way our application software will give support to the woman and the time they are connected with PHC. In case of any emergency, immediately bring the attention of PHC. The Application has been developed in Java and enabled as web application. The patient details are entered online and stored in the database available in the district head quarters (Government Hospital in District). A unique PICME number is assigned to the pregnant woman registered in PHC. All related information such as personal details including pregnancy details, scan /lab reports, vaccination details and baby information is being entered using Notebook Computers while at the time of patient visiting to PHC or through nurses visit to the home of the patient. All the data are maintained in the application software. The periodic vaccination alert, diet to follow, check up reminders and other useful information is being monitored through social network or mobile phones. We can generate various statistical reports with the

available information. By this way the patient health is monitored successfully and ensures the safety of both mother and baby.

The proposed application software will get the complete information of a pregnant woman and baby growth. The same can be interoperated with the e-governance system implemented by state government. The issuing of birth/community certificate will be very easy. The child berth details throughout the state are being maintained in a centralized database. Big data analysis and Data mining is possible for generating various reports related with maternity and child birth.

Health Care Monitoring

This phase is used to monitor the patient"s physiological parameters. For example a pregnant woman parameters such as blood pressure (BP) and heart rate of the woman and heart rate and movements of fetal to control their health condition. SMS alert such as check up reminders, lab report and emergency services will be also sent to patients. The use case diagram and sequence diagram of health care monitoring are shown in figures (7) and (8).

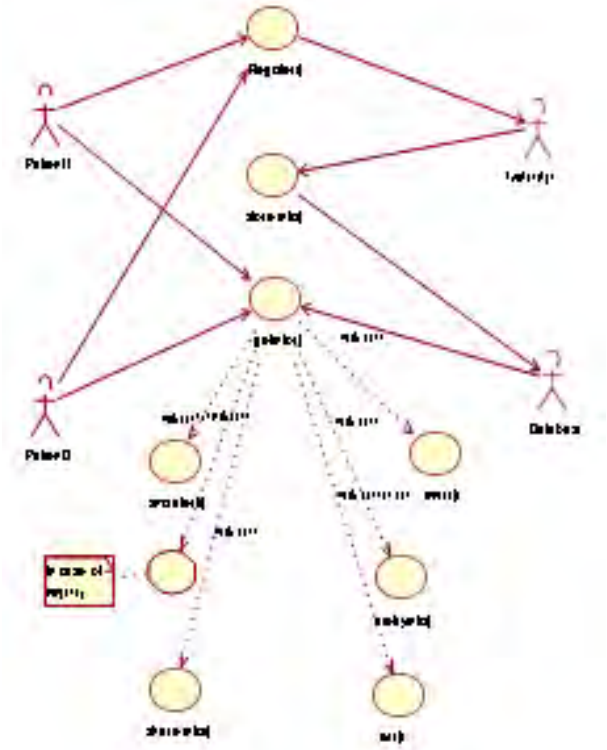


Fig.5. Use Case Diagram of the Process

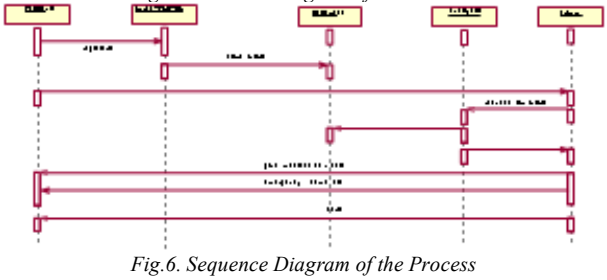


Fig.6. Sequence Diagram of the Process

Mining Technique Implementation

Data mining task is the automatic or semi-automatic analysis of large quantities of data to extract previously unknown interesting patterns such as groups of data records (cluster analysis) and dependencies (association rule mining). This usually involves using database techniques such as spatial indices. These patterns can then be seen as a kind of summary of the input data and may be used in further analysis or, for example, in machine learning and predictive analytics as shown in Figure. 9. For example, the data mining step might identify multiple groups in the data, which can then be used to obtain more accurate prediction results by a decision support system.

VI. OUTCOMES EXPECTED

Efficient application software for Health Monitoring of a reminders, emergency services and useful health tips. Statistical information can be obtained immediately through mining techniques.

VII. CONCLUSION AND FUTURE SCOPE

Government implemented health services in all the villages through PHC and allied networks. Data are collected from the patients manually; no automatic health care maintenance system is available. Hence monitoring the patient is very difficult. The application software described in the above work is an attempt to digitize all the data and it is being connected with all health centres. The recent techniques such as Big data analysis/Data Mining techniques also used to obtain the statistical information whatever needed by the government. This application software concentrates on pregnant woman data and it is implemented. In future the same can be implemented as a cloud environment extending to all the diseases.

REFERENCES

[1] The Digital Universe: Driving Data Growth in Healthcare. Available at: https:// www.emc.com/analyst- report/digital-universe-healthcare-vertical-report-ar.pdf (Accessed 23 Feb 2017).

[2] Parikh, R. B., Schwartz, J. S. & Navathe, A. S. Beyond genes and molecules - a precision delivery initiative for precision medicine. N. Engl. J. Med. 376, 1609–1612 (2017).

[3] Parikh, R. B., Kakad, M. & Bates, D. W. Integrating predictive analytics into high- value care: the dawn of precision delivery. JAMA 315, 651–652 (2016).
[4] Bates, D. W., Saria, S., Ohno-Machado, L., Shah, A. & Escobar, G. Big data in health care: using analytics to identify and manage high-risk and high-cost patients. Health Aff. 33, 1123–1131 (2014).
[5] Krumholz, H. M. Big data and new knowledge in medicine: the thinking, training, and tools needed for a learning health system. Health Aff. 33, 1163–1170 (2014).
[6] Jameson, J. L. & Longo, D. L. Precision medicine-- personalized, problematic, and promising. N. Engl. J. Med. 372, 2229–2234 (2015).
[7] Dr.S.Lavanya, Dr.J.Preetha and Dr.S.Deepajothi "Scalability Structural Health Monitoring Sensor Placement with Synchronization Using Clustering" International Journal of Innovative Research in Science, Engineering and Technology,Volume 8,Issue 8, 8561-8566, 2019/8
[8] Goldstein, B. A., Navar, A. M., Pencina, M. J. & Ioannidis, J. P. A. Opportunities and challenges in developing risk prediction models with electronic health records data: a systematic review. J. Am. Med. Inform. Assoc. 24, 198–208 (2017).
[9] Press, G. Cleaning big data: most time-consuming, least enjoyable data science task, survey says. Forbes (2016).
[10] Lohr, S. For Big-Data Scientists, „Janitor Work" Is Key Hurdle to Insights. (NY Times, 2014).
[11] Drew, B. J. et al. Insights into the problem of alarm fatigue with physiologic monitor devices: a comprehensive observational study of consecutive intensive care unit patients. PLoS ONE 9, e110274 (2014).
[12] Chopra, V. & McMahon, L. F. Jr. Redesigning hospital alarms for patient safety: alarmed and potentially dangerous. JAMA 311, 1199–1200 (2014).
[13] Kaukonen, K.-M., Bailey, M., Pilcher, D., Cooper,
D. J. & Bellomo, R. Systemic inflammatory response syndrome criteria in defining severe sepsis. N. Engl. J. Med. 372, 1629–1638 (2015).
[14] LeCun, Y., Bengio, Y. & Hinton, G. Deep learning. Nature 521, 436–444 (2019).
[15] Frome, A. et al. DeViSE: a deep visual-semantic embedding model. In Advances in Neural Information Processing Systems 26 (eds Burges, C. J. C., Bottou, L., Welling, M., Ghahramani, Z. & Weinberger, K. Q.), pp 2121–2129 (Curran Associates, Inc. Red Hook, NY, 2013).
[16] Gulshan, V. et al. Development and validation of a deep learning algorithm for detection of diabetic retinopathy in retinal fundus photographs. JAMA 316, 2402–2410 (2016).
[17] Wu, Y. et al. Google"s neural machine translation system: bridging the gap between human and machine translation. arXiv [cs.CL] (2016).
[18] Dai, A. M. & Le, Q. V. Semi-supervised sequence learning. In Advances in Neural Information Processing Systems 28 (eds Cortes, C., Lawrence, N. D., Lee, D. D.,2020).
[19] Bengio, Y., Courville, A. & Vincent, P. Representation learning: a review and new perspectives. IEEE. Trans. Pattern Anal. Mach. Intell. 35, 1798–1828 (2019).
[20] Weed, L. L. Medical records that guide and teach. N. Engl. J. Med. 278, 652–657 (1968). concl. Sugiyama, M. & Garnett, R.), pp 3079–3087 (Curran Associates, Inc. Red Hook, NY,

This page is kept blank intentionally

Vehicle Security Using NFC Ring

Anurag Singh
Electronics & Telecommunications
Thakur College of Engineering & Technology
Mumbai, India
anurags0405@gmail.com

Jatin Tak
Electronics & Telecommunications
Thakur College of Engineering & Technology
Mumbai, India
jatintk123@gmail.com

Atul Yadav
Electronics & Telecommunications
Thakur College of Engineering & Technology
Mumbai, India
atul18542@gmail.com

***Abstract*— Vehicle security is one of the most underdeveloped sectors of the automobile industry hundreds of bikes and cars get stolen daily. To improve this condition of vehicle theft, we have tried to create a contactless, simple solution, i.e., an NFC Ring. The NFC Ring is derived from the technology of NFC (Near-Field Communication), which is currently popular in the credit/debit card sector. The user will use it to turn on the ignition instead of a mechanical key saving us time and increasing security as the NFC code is not easy to replicate for any ordinary thief.**

Keywords*— Near-Field Communication, credit/debit, Arduino, immobilizer.

I. INTRODUCTION

Today, smartphones are high performance platforms providing a wide range of features and have become an integral part of our daily life. The increasing computing and storage capabilities, the vast number and variety of apps avail-able on app stores and new communication interfaces, such as Near Field Communication (NFC), provide many deployment possibilities for smartphones, including electronic ticketing, payment and access control. In this context, an emerging trend is the integration of smartphones
into modern automotive systems and applications such as access control to unlock, configure and start vehicles. In particular, the NFC interface is well-suited for such applications due to its short nominal communication range (of a few centimeters) providing basic assurance of the user's physical proximity. In this paper, we focus on Ring based NFC-enabled immobilizer systems. An electronic vehicle immobilizer is an anti-theft ring that prevents unlocking the vehicles unless the corresponding access token is (physically)present and authenticated. Currently, this access token is a transponder (i.e., an RFID chip) embedded into a ring. Ring based immobilizer systems promise to enhance the user experience by providing a variety of appealing new features and enabling flexible applications beyond what is provided today by conventional transponder-based immobilizer systems. They eliminate the risk of misplacing a car key as we can wear them 24×7 Moreover, access rights cannot be delegated to other users, revoked or bound to specific policies. In particular, automotive applications with a highly dynamic or large set of users, such as car sharing and fleet management, can highly benefit from ring-based immobilizers. This Keyless car entry Authentication System Based on An NFC fitted Ring Structure which is used to communicate with the of the system fitted in the car and compare it with the data stored or saved inside it. Our goal and contribution. We present a ring-based immobilizer system architecture and the underlying security framework, which provides enhanced functional and security features and overcomes the security issues of the conventional immobilizer systems. In particular, our contribution is as follows:
Framework for ring-based immobilizer systems. Our framework considers the functional and security requirements on the protocols and the system architecture of a ring-based solution under realistic adversary models. Evaluation of existing security hardware. We evaluate and discuss various instantiations of our security architecture using different approaches to establish trusted execution environments on NFC. Implementation. We present an implementation of our immobilizer system on NFC using a simple ring structure. We show that it is feasible to implement a secure NFC enabled immobilizer system. In particular, we discuss the conditions for the secure integration of enhanced features such as delegation under a strong but realistic adversary model, where the adversary has full control over the Rings software. Hereby, we take the technical limitations of currently available security hardware for smartphones into account. Outline. We present our framework for NFC-based immobilizer systems and the requirement analysis. We describe the platform security architecture. and discuss the working of our project.

II. REVIEW OF LITERATURE

A. Near field communication

NFC is a very important technique. Here will be the integration of technology in mobile phones to make people's lives much easier. Among those companies Nokia and some other companies in the market today with the presence of NFC in mobile phones of their own will be part of mobile phones in the future. NFC has a lot of applications in everyday life. We will not be need to carry cards, different electronic such as access cards, debit cards / credit cards and identity will be the cards are already in the cell phone, and will use them anywhere we want and will not transfer data easily from any device to another. And also, do not need to repeat

the keys because we can use only one phone instead of keys. Even more, we can buy and store e-tickets on the cell phone and there is also a set of criteria to determine the work of smart phones and similar devices to be the wireless contact them by touching each other or make them side by side, and not more than the distance of a few centimeters. There are also the current and anticipated applications include data sharing, and simplified setup of more complex communication such as Wi-Fi. Communication is also possible between the device and the NFC chip unpowered NFC, which is named "tag".

B. Near field communication (NFC) model for ArduinoUno based security systems office system

Nowadays a lot of office offices or a company that began to grow rapidly in a company or office must have a room that is very limited to enter only the right people to enter it into the room and use existing facilities there in, for example the file space in it must be a lot of files and documents are very important because to reduce the misuse of a file, files and facilities in it. This research will discuss about Near Field Communication (NFC) model for Arduino Uno office file security system with NFC input and process using Arduino Uno to generate servo output to move the door and buzzer for error notification if there is no access rights to enter indoors and a PIR Sensor that will detect that a person will enter into the room so that the light or LED will be automatically turns on. NFC Shield is a Near Field Communication interface for Arduino building around the popular NXP PN532 integrated circuit. NFC is a short-range radio technology that allows communication between devices held close together. The NFC traces its roots in RFID technology and open platform technologies are standardized in ECMA-340 and ISO / IEC 18092. The NFC Forum develops and declares compliance devices with NFC standards. NFC operates at 13.56 MHz ISM Frequency. NFC has 12 MHz crystal and 12 Volt power supply. Pin I / O from PN532 can be accessed easily using communication via SPI (Serial Port Interface).

C. GPS and GSM Based Vehicle Tracking System

Tracking system is nowadays the most important system for the person; they want their car security in efficient hands this is the main reason. So, the vehicle tracking system are getting popular day by day not only in metropolitan areas but also in small cities. This system is completely integrated and it becomes possible to the user to track their car very easily at any time and from anywhere. As the vehicle theft is increasing day by day but due to this people wasn't avoiding buying vehicles but they found an efficient way to keep an eye on their vehicle without being very close to them. These systems keep a good control on the thefts and help avoiding them to some extent. Basically, in all these systems the GPS and GSM are used to track the vehicle. Using this system, the user determines the position of the vehicle, and the distance completed by it. The user is able to access the position of their vehicle at any instant of time. This system is reliable any very secure. Upgrading this setup is very easy which makes it open to future requirements without the need of rebuilding everything from scratch, which also makes it more efficient. GSM module used in this paper to send and receive SMS. GSM module can support 2G, 3G and 4G but only 2G can supported in this country, because each country uses different frequency bands for GSM SIM 900A. So, MPT and Telenor were used and Ooredoo and my tell were not used in this thesis. And then GSM module can also interface with Arduino when using AT command. Adding that, GPS module was not get the signal from GPS Satellite easily.

D. A digital vehicle monitoring system based on 3G for public security

With the rapid development of Information technology, wireless and networking, the use of digital vehicle monitoring system has significant value for public security. This paper proposes the architecture and functions of the digital vehicle monitoring system based on 3G for public security. This system provides a secure police vehicle network platform, which allows capturing video, voice and data real-timely from a vehicle, and transmitting all of data to the monitoring and command center. With access to rich multimedia applications, the officers in the command center have greater situational awareness and therefore are equipped to make better decisions more quickly. This system takes full consideration of security of video captured, which creates powerful evidence for prosecution or exoneration. The system proposed in this paper can also provide some reference for the vehicle monitoring and tracking.

E. Smart Keys for Cyber-Cars: Secure Smartphone-based NFC-enabled Car Immobilizer

Today, smart phones are high performance platforms providing a wide range of features and have become an integral part of our daily life. The increasing computing and storage capabilities, the vast number and variety of apps available on app stores and new communication interfaces, such as Near Field Communication (NFC), provide many deployment possibilities for smart phones, including electronic ticketing, payment and access control. In this context, an emerging trend is the integration of smart phones into modern automotive systems and applications such as access control to unlock configure and start vehicles. In particular, the NFC interface is well-suited for such applications due to its short nominal communication range (of a few centimeters) providing basic assurance of the user's physical proximity. In this paper, a smart phone-based NFC-enabled immobilizer system is proposed. An electronic vehicle immobilizer is an anti-theft device that prevents starting the vehicle's engine unless the corresponding access token is (physically) present and authenticated. Currently, this access token is a transponder (i.e., an RFID chip) embedded into the mechanical car key or a contactless smartcard.

III. PAPOSED MATHADOLOGY

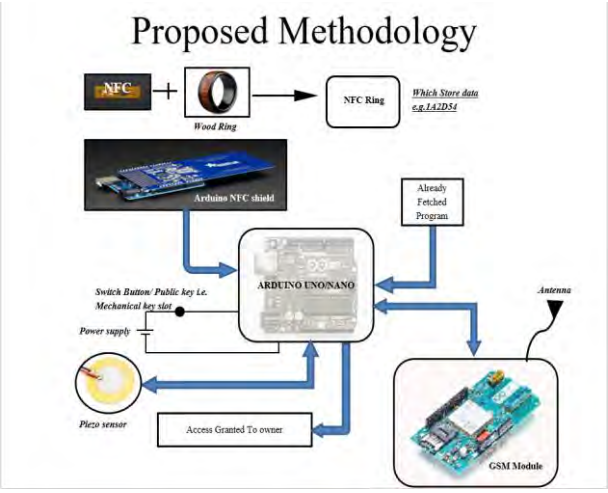


Fig1. Proposed Methodology

- In proposed methodology, The New approach is taken to develop the modern key. Here the NFC is use, it's Chip which contain some antenna when it's come in electromagnetic field then Emf get induced and start transmitting the store Data to NFC shield.
- Here the NFE chip which have a very small dimension Because of that it can be implemented in Normal rings that implementation part is shown in Figure2. And its dimension is Label in Figure3.

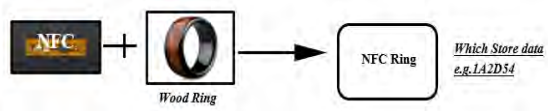


Fig2. Method to develop NFC Ring.

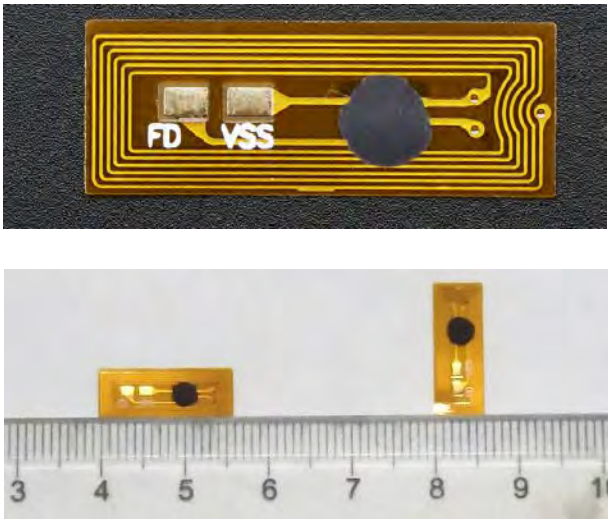


Fig3. Dimension of Used NFC.

- After Developing the Ring, the Unique Combination of Data can be store by Owner Company. And it acts like a Key.
- The Lock part is connected with engine unless right key is not come in contact with Bike till access is not provided to anyone.
- As the battery bike has less capacity so the owner can't be on the GPS module for Continuous period. Here the GPS module is always in standby mode till the piezo detect any unnecessary shock which will caught by, trying to getting access of any original key.
- By putting the GPS module in standby mode, the it will continuously active for 1 month.

A. *Advantage*

- Enhance security.
- Duplication of key tough.
- Key is easy to carry as it can be wearing as a ring.
- Active location tracking.

B. *Disadvantage*

- Little expensive them mechanical key.
- Only company can provide alternative in case key is loosed.
- GPS network issue.

IV. RESULT

The Expected output, it should tedious to use as the mechanical key required a new attention while carrying means owner need the attention toward the mechanical key. If the owner is in hurry, he/she might forget to take the key with him with cause Loss of time as well as mechanical is easy to Duplicate. But the NFC ring is physically look similar and for duplication is only possible by seller company. Which make it more secure.

V. CONCLUSION

Near Field Communication has already begun to shape the future of electronic gadgets in people's life. As the prices of chip manufacturing falls, the likelihood is that NFC-enabled mobile phones will become standard and their applications will become a part and parcel of life. According to a survey it is found that NFC technology was preferred by people over other technologies including Bluetooth Beacons and QR codes. It is inferred that NFC technology works on the basis of RFID technology which uses magnetic field induction as a medium to establish communication between electronic devices placed closely and operating at 13.56 MHz as it is unlicensed frequency and can transmit data at a maximum rate of 424kbps. NFC like any other technology has its own pros and cons. When compared to other technologies however presently it is less popular but with the increasing android applications, soon it will become a need. In the present world where digital transaction is so common, there exist people who try to manipulate, disrupt or misuse the data that is transmitted and so users will no doubt initially be concerned about the security of their

personal data that is stored on the NFC devices. Still besides
this, it is a must application for smart phones and our application of ring and people need to be made aware about how it works.

VI. ACKNOWLEDGMENT

The authors are thankful to Thakur College of engineering and technology for providing necessary resources required to accomplish this project and providing an opportunity to enhance our Knowledge and widen our skill set. The authors are also thankful to Mr. Nikhil Tiwari for providing guidance and their supervision of the project.

VII. REFERENCES

[1] Hussein Ahmad Al-Ofeishat, Mohammad A.A.AL Rababah, Near Field Communication(NFC), IJCSNS International Journal of Computer Science and Network Security, VOL.12 No.2, February 2012.

[2] A Chairunnas and I Abdurrasyid , Near field communication (NFC) model for arduino uno based security systems office system, IOP Conference Series: Materials Science and Engineering, Volume 332, Indonesian Operations Research Association - International Conference on Operations Research 2017 12 October 2017, Tangerang Selatan, Indonesia.

[3] Prachi R. Rajarapollu, Nutan V. Bansode ,Pranoti P. Mane, A novel two wheeler security system based on embedded system, 2016 2nd International Conference on Advances in Computing, Communication, & Automation (ICACCA) (Fall), 30 Sept.-1 Oct. 2016.

[4] Ni Ni San Hlaing, Ma Naing, San San Naing, GPS and GSM Based Vehicle Tracking System, International Journal of Trend in Scientific Research and Development (IJTSRD), Volume: 3 Issue: 4, May-Jun 2019.

[5] Sichao Liu, Yingfeng Zhang, Yang Liu, An 'Internet of Things' enabled dynamic optimization method for smart vehicles and logistics tasks, Journal of Cleaner Production, Volume 215, 1 April 2019.

[6] Hua Ye, Gang Ding, A digital vehicle monitoring system based on 3G for public security, 2010 International Conference on Computer and Information Application, 3-5 Dec. 2010.

[7] Mouloud Denai, A Smart Wireless Car Ignition System For Vehicle Security, Advances In Automobile Engineering, September 19, 2017.

RFID Tag Based Bus Tracking System

Satyam .S. Singh
Department of Electronics and Telecommunications Engineering
Thakur college of Engineering and Technology
Mumbai, India
staymsinsghsss0101@gmail.com

Rana Shivamev Singh
Department of Electronics and Telecommunications Engineering
Thakur college of Engineering and Technology
Mumbai, India
ranasingh2686@gmail.com

Jaikumar Yadav
Department of Electronics and Telecommunications Engineering
Thakur college of Engineering and Technology
Mumbai, India
jayyadav10167@gmail.com

Mrs. Archana Deshpande
Asst. Prof., Department of Electronics and Telecommunications Engineering
Thakur College Of Engineering and Technology
Mumbai, India

***Abstract*— RFID is a technology similar to that of bar code scanning. An RFID system consists of tags, which use radio frequency signals to transmit its location information to a reader, which usually sends this information to a server that processes it according to the needs of the application. This paper presents a system that can track buses across a city by placing RFID tags in the buses and the readers in every alternative bus stop. The local server for the city recieves the location information, and alerts the forthcoming bus stops in the route of the bus, of the bus' number, route and expected time of arrival, which are then displayed at the stop.This system thus describes is a cost effective and easy to implement scheme for tracking buses in real time.**

Keywords— GPS; Smart bus stops;Smart phones

I. INTRODUCTION

The main origin of our project research is that as number of people using public transport is increasing day by day parking problems are also rising on the road so as a solution to this problem we came with a concept called as 'BUS TRACKING SYSTEM. As we all know today's bus tracking system needs to get upgraded since a lot of people waste time while waiting for the bus. So we are proposing a system which will not only make this system more systematic but also will make person's life more easier, Basically this project will help people using public transport to know whether their respective buses are on time or not and will make the system more systematic as compared to earlier. Common people using public transport will be more aware regarding their respective buses whether they are on time or not. So the importance of this project is immense.

II. LITERATURE SURVEY

1) A Smart Bus Tracking System on Location Aware Services and QR Codes[1]
In this paper, we proposed a smart bus tracking system that any passenger with a smartphone or mobile device with the QR (Quick Response) code reader can scan QR codes placed at bus stops to view real time status. In this report we found C4.5 (a statistical classifier) algorithm for the estimation of bus arrival times to minimize the passengers waiting time. GPS (Global Positioning System) and Google Maps are used for navigation and display services, respectively.

2) GPS Based Bus Tracking System[2]
The report provides a clear pre-processing of a GPS based bus tracking system. This also states what is needed for bus tracking. With that it also guides us how to connect it with sms and email and then send the location to parents and admin at the same time. We have found a Kalman filtering model which gives real time and accurate location of the destination and the bus

3) RFID Based System For Bus Location Tracking and display it.[3]
This method uses RFID tag in the bus which detects bus code from chip via RFID reader and the computer reads the data and the data is send to the server which is stored in the database and then the location gets displayed in the display. This structure brings a change in our bus system by tracking the busses and estimating the time of their arrival and delays .The display helps the individuals in the bus stations be aware of the destination, timings of a particular bus.

4) Android Based Bus Tracking System.[4]
Introducing the vehicle auto tracker using GPS and GSM Technology for position information and using Google map to locate and show the location in the android phone. This can be efficiently used for alternative route when a particular route is blocked and can work can as an interactive system.

5) Application Based Bus Tracking System[5]
This research is based on the Bus Tracking System. The main objective of this work is to make a GPS tracking application which would be able to track school buses more accurately and efficiently than present bus-tracking systems. Kalman filter is a technique which is implemented for increasing the accuracy of the location.

III. SCOPE OF PROJECT

Here in this proposed smart bus tracking system that any passenger with a smartphone or mobile device with the QR (Quick Response) code reader can scan QR codes placed at bus stops to view estimated bus arrival times, buses' current locations, and bus routes on a map. Basically the QR code will contain the information of landing page where each and every details regarding the bus is present with real time analysis. Anyone can access these maps and have the option to sign up to receive free alerts about expected bus arrival times for the interested buses and related routes via SMS and emails. We used RFID TAG to locate the bus and bus stop and the route it will follow to minimize the passengers waiting time. GPS (Global Positioning System) and Google Maps are used for navigation and display services, respectively.

With rising fuel prices, and ever increasing traffic on the roads, the objective of any Government remains to provide an efficient public transport system, that can cater to the needs of citizens. People still prefer to use a private vehicle over the public transport system owing to the reason that they do not know the public vehicle scheduling information and its arrival timing at any predefined bus stops. It is possible to motivate people to use public transport if the scheduling information and arrival times on different predefined stops can be provided on different channels.

A GPS/GPRS tracking system for Public Transport system where the current location and ETA of any vehicle on any predefined bus stop can be determined and information can be either displayed on the stops or provided to people in general over different channels. Say – Mobile Web Page, SMS, or Transport website. Knowing in advance the expected arrival times of a bus other public vehicles can really motivate people in general, to use the service instead of taking out personal vehicle. With the system in place, the transport department can also plan its route in more efficient and effective manner depending upon demand and supply in any particular region in a given time slot.

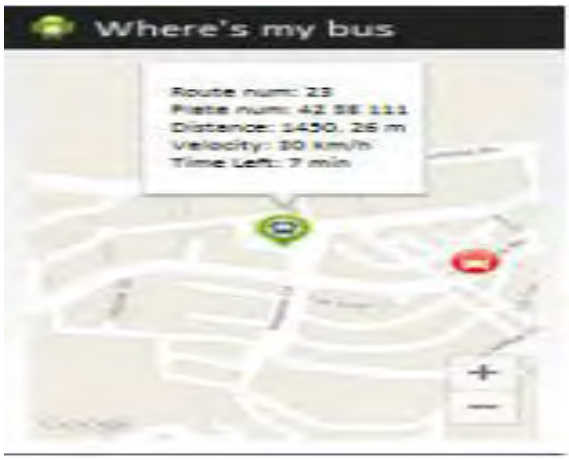


Fig1: Viewing bus information

The main origin of our project research is that as number of people using public transport is increasing day by day parking problems are also rising on the road so as a solution to this problem we came with a concept called as 'BUS TRACKING SYSTEM'.As we all know today's bus tracking system needs to get upgraded since a lot of people waste time while waiting for the bus. So we are proposing a system which will not only make this system more systematic but also will make person's life more easier. Basically this project will help people using public transport to know whether their respective buses are on time or not and will make the system more systematic as compared to earlier.

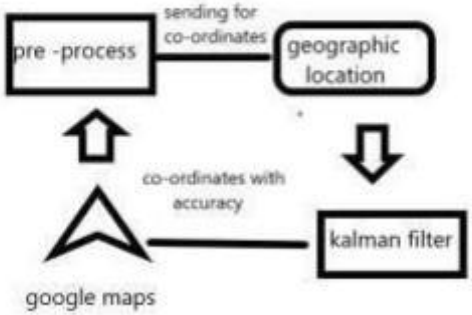


Fig2: Prototype of proposed architecture

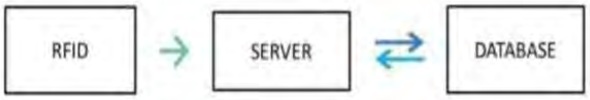


Fig3: Basic Block Diagram

IV. RESULTS

1) The System gives output in the form of bus details which includes information about bus routes, bus arrival and departure timings, locations. Moreover, in cases like if bus fail to complete its journey due to certain circumstances like failure in the mechanism, the bus depot will be notified automatically.

2) After studying all the devices we have proposed our idea to the project guide.

3) Then after working on the suggestions provided by our project guide, we have come up with the final idea of our project

V. CONCLUSIONS

The overall design of the bus management system based on multi-node RFID cards and GPS. In this work we have developed AISFBRM- the autonomous informative services for bus route map that is flexible, affordable, customizable and accurate. Through this technology, we enable travel agents to track information

about their transportation service. We have also demonstrated the credibility of the design through field trials and the initial results obtained through our prototype are very promising. But with the advent of this technology, it would make more sense for commuters to know the current location of the bus and expected time of arrival and also delay if any before coming to the bus stop or while standing at bus stop without having to depend on the display system and this has been the major contribution of our research.

VI. ACKNOWLEDGEMENT

We sincerely thank our guide Mrs. Archana Deshpande for her guidance and constant support and also for the stick to our backs. We also thank the project coordinators for arranging the necessary facilities to carry out project work. We thank the HOD, Dr. Payel Saha, Dean Academic, Dr. R.R Sedamkar, Vice Principal, Dr Deven Shah, The Principal, Dr. B. K. Mishra, the and the college management for their support.

REFERENCES

1. A Smart Bus Tracking System Based on Location-Aware Services and QR Codes. Süleyman Eken and Ahmet Sayar Department of Computer Engineering Kocaeli University, Kocaeli , Turkey 2014.

2. Application Based Bus Tracking System. Shubham Jain, Adarsh Trivedi, Shweta Sharma Department Of Computer Science And Technology Manav Rachna International Institute of Research And Studies Faridabad, India 2019.

3. GPS Based Bus Tracking System.Leeza Singla1, Dr. Parteek Bhatia Thapar University Patiala, India leezasingla91@gmail.com1, parteek.bhatia@thapar.edu2 2015.

4. RFID Based System For Bus Location Tracking And Display. Maria Anu, Sarikha D, Sai Keerty G, Jabez J International Conference on Innovation Information in Computing Technologies (ICIIT) , Chennai, India 2015.

5. Design and Development of Android Based Bus Tracking System. K Sujata, K J Shruthi, PV Nageswara Rao, A Arjuna Rao First International Conference on Network and Soft Computing 2014.

This page is kept blank intentionally

Smart Vehicle Accident Detection System Using IOT

Ms. Richa Mamtora
Department of Electronics Engineering
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - India
richamamtora2000gmail.com

Mr. Shubham Kanaujia
Department of Electronics Engineering
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - India
shubhamkanaujia333@gmail.com

Mr. Shubham Maurya
Department of Electronics Engineering
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - India
saurabhmaurya4521@gmail.com

***Abstract* — With an increase in population, there is increase in the number of accidents that happen every day. Due to which many deaths have taken place. There are situations where most of the accidents could not be reported properly to nearby ambulances on time. In most of the cases, there is the unavailability of emergency services which lack in providing the first aid and timely service which can lead to loss of life by some minutes. Hence, there is a need to develop a system that can solve these problems by detecting the accidents and messaging the emergency numbers so that the immediate action can be taken. This system will have a sensor so that the accident can be detected.**

Keywords* — *Arduino, Car accident, Internet of Things (IOT), Sensor

I. INTRODUCTION

Road accident is most unwanted thing to happen to a road user, though they happen quite often. Nowadays there is an increase in the accidents that happen in the world. These accidents contribute to the severe accidents that happen everyday and thus people's lives are on stake. Around 15.7% of total deaths in India are due to these accidents. Out of all the developing nations, India has been listed with a higher number of accidents. Every day around 1,250 accidents takes place and 30% of them results in deaths. According to the survey, highest number of accidents occur due to over speeding and drunken driving. The moment accidents occur, the life of all the passengers are at stake.

The prominent reason for the loss of lives during an accident is the unavailability of immediate help. Thus every second during an accident is very crucial. Therefore an immediate help should be provided to the passengers.

In this world of technology, we can use it as a life savior. Internet of Things (IOT) is the heart of technologies. Its applications are can make our lives way better. However, IOT can be considered incomplete without the use of sensors. We are focusing the valuable lives of people which can be saved by implementing this technology.

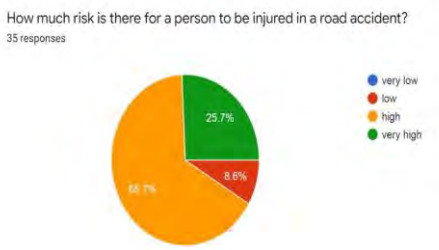


Fig1. survey

II. PROPOSED FRAMEWORK

In the above Figure 1 we can see that the risk for a person to be injured in a road accident is high/very high. In most of the cases the injured person is not taken to the hospital in time and thus he/she may lose their life. The system is expected to solve the problem by incorporating more features with the above discussed functionalities, this system can resolve most of the accident scenarios by detecting accidents on time and triggering immediate help from emergency services without wasting any time. Moreover,

the driver's health is being tracked by heart rate sensor (embedded in seatbelt) , temperature detection, speed of the car and sudden decreased in the fuel, all these serves as the added advantage. If implemented with proper planning and resources, this framework could serve to be a great help to the society. Hence, there is need of such systems that could save the lives involved with accidents.

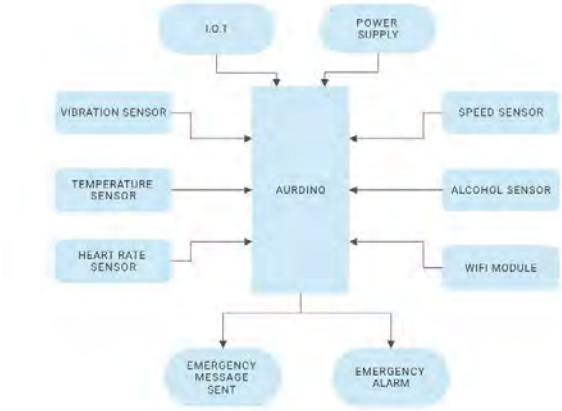


Fig 2. components

III. PROPOSED ARCHITECTURE & METHODOLOGY

The significance of this methodology is to address the gaps in the previous literature and contribute to the existing work on this project. As shown in Figure 3, this can be achieved by adding more functionalities and framework into this. We will be implementing this system with the help of IOT. Arduino is main unit for project to detect the accident and alert the driver. When any accident occurs, the Arduino will collect the data through the sensors and immediately send the information through IOT in the cloud server. The vibration sensors will give two types of results, low and high. During an accident, the vibration sensor will consider it as high and it will be detected. The sensors will also track the heart rate of the driver which will be placed in the seat belt of the driver. The speed of the car will be tracked by the sensor thus alarming about the over speeding and the alcohol tracker will be used to measure the amount of alcohol consumed while driving. Temperature will be detected by the sensors which will make sure the accident hasn't occurred. During an accident, sometimes there is a sudden discharge in the fuel. A tracker will be used to have an eye for the decreasion in the fuel. This system is a combination of all the possible sensor of modules which includes both hardware and software and can be very useful in the vehicles.

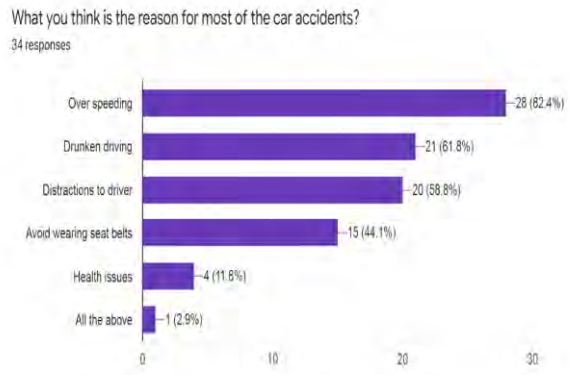
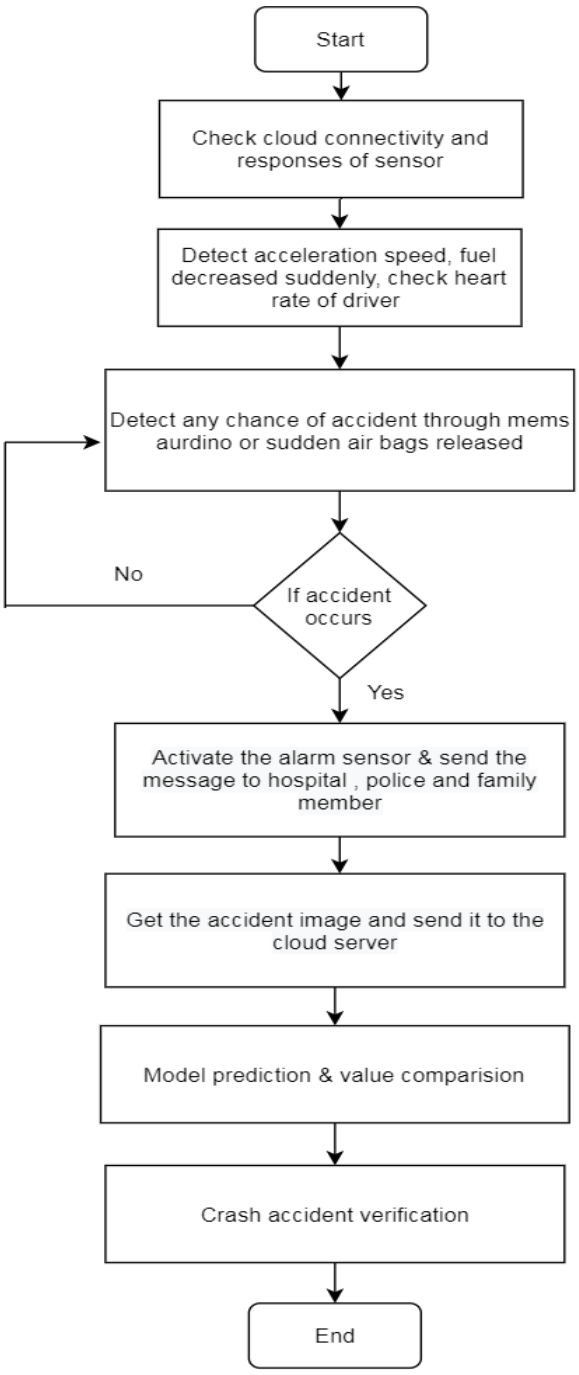


Fig 3. survey

IV. FIELD SURVEY

According to survey shown in Figure 3, it has been seen that the higher number of accidents are caused due to over speeding and drunken driving. Faster vehicles are more prone to accident than the slower one,a vehicle moving on high speed will have greater impact during the crash and hence will cause more injuries. The ability to judge the forthcoming events also gets reduced while driving at faster speed which causes error in judgment and finally a crash. Alcohol reduces concentration. It decreases reaction time of a human body. The road accidents can lead to the loss of human life. India is one of the leading countries in road vehicle accident. Many times public hesitate to help the injured person thinking they might get called for police inquiry. In India there are many regions which are very far away from the hospitals and in such cases the injured person might not get the treatment at the correct time. It has been seen that the injured person is not given the necessary treatment at the right time and it is also difficult to contact their family members about it. There are also some health issues that even the driver is unaware of. For instance, increase in heart rate and blood pressure. Thus, the problem we are focusing on is how to minimize the time required for an injured person to get the proper treatment and to detect
the accident before it reaches to the final stage, also inform their family members for the same.

V. FLOWCHART



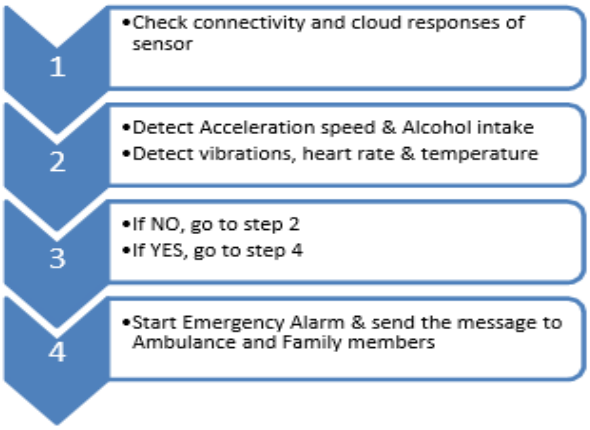
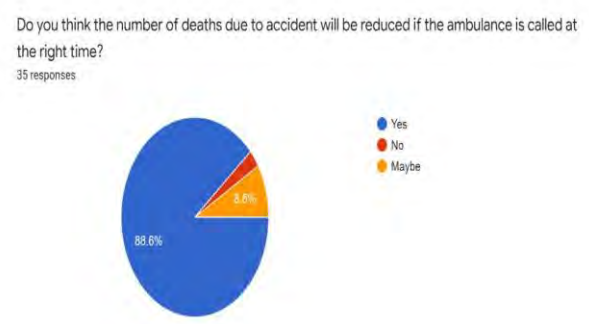


Fig. 4- steps of implementation

VI. RESULT

As shown in the design/objective of Figure 4, it will be followed for the execution of the project. Using IOT, the responses will be checked and if the alcohol level / speed of the vehicle / level of vibrations / heart rate or the temperature is not at a particular level then the emergency alarm will be on. If any accident has occurred then the message will be sent immediately to the server and the required authorities. Accidents are surely undesirable but can occur any time any where, using this system we can minimize the number of deaths caused due to road accidents. Family members can reach the hospital by the emergency message sent to them. This system is a cost effective and real time feasible. By using this system we can surely reduce the number of accidents as well as the number of deaths which takes place due to the road accidents. The mechanism will be very useful for the society to minimize the number of accidents and providing the emergency services as soon as it has occurred.



VII. FUTURE SCOPE

The future of this system is expected to be very bright. With the increase in number of accidents happening everyday, this might be a great way to save lives of people and decrease the accidents as much as possible. With implementation and regular hardwork this can be improved and can be made more advance.

VIII. CONCLUSION

As shown in figure 5 the survey says that the number of deaths due to accident will be reduced if the ambulance is called on time. Accident is an unplanned event and sometimes it can lead to undesirable consequences. Though we cannot stop an accident but we can surely can some precautions like not to over speed, not to drink and drive and following all the guidelines. Wearing seat belts have been brought under law after proven studies that it reduce the severity of injury during accidents. Wearing seat belts doubles the chances of survival in a serious accident. Many people in India don't take the traffic rules seriously and tend to outrun them. If we follow them seriously and take the necessary measures then surely the rate of accidents in India will be reduced. The system used here can be used for avoiding accidents as well as notifying concerned authorities by providing them the exact location. Especially in India where accidents are at a very high rate. By this system we can surely reduce number of accidents scenarios by detecting the accidents on time and asking for immediate help to save lives. If implemented with proper planning, designing and resources, this could serve as a great help to the society.

ACKNOWLEDGMENT

This work- ' Smart Vehicle Accident Detection System using IOT' wouldn't be possible Dr. B.K Mishra for giving this opportunity, our mentor Mr. Hemant Kasturiwale for his support in this project and boosting our morale, head of the department Dr. S.C Patil and special thanks to our department faculties for supervising and encouraging us in the research for this useful project.

REFERENCES

[1] Aishwarya S. R., et al., "An IoT Based Accident Prevention and Tracking System for Night Drivers," International Journal of Innovative Research in Computer and Communication Engineering, vol/issue: 3(4), Apr 2015

[2] Upendra Y. and Kamalkannan, "Smart Vehicle Monitoring System using IOT," International Journal for Development of Computer Science and Technology, vol. 5I-3,SW-31

[3] H. M. Ali and Z. S. Alwan, "Car Accident Detection and Notification System Using Smartphone," International Journal of Computer Science and Mobile Computing, vol/issue: 4(4), pp. 620-635, Apr 2015.

[4] V. K. Pratiksha and Rajesh G., "Proposed Model for the Smart Accident Detection System for Smart Vehicles using Arduino board, Smart Sensors, GPS and GSM," International Journal of Emerging Trends and Technology in Computer Science, 2015.

[5] Pin W. and Junhua W., "A Vehicle Collision Detection Algorithm at T- shaped Intersections based on Location Based Service," International Conference on Recent Trends in Electrical, Electronics and Computing Technology, Oct 2015

[6] Dhanlakshmi and Ezil S. L., "Instance Vehicle Monitoring and Tracking with Internet of Things using Arduino," International Journal on Smart Sensing and Intelligent Systems, Sep 2017.

[7] Pengfie Z., et al., "Secure Location of Things (SLOT) : Mitigating Local Spoofing Attacks in Internet of Things," IEEE Internet of Things Journal, vol. 4, Dec 2017.

[8] Gowshika , Madhu Mitha, Jayashree ,S.Mutharasu, "Vehicle Accident Detection System by using GSM and GPS" (International Research Journal of Engineering and Technology, January 2019)

[9] T Kalyani ,S Monika ,B Naresh , "Mahendra Vucha Accident Detection and Alert System" (International Journal of Innovation Technology and Exploring Engineering, March 2019)

[10] Shivani Sharma, Shoney Sebastian, " IOT based car accident detection and notification algorithm for general road accidents" (International Journal of Electrical and Computer Engineering, October
2019)

This page is kept blank intentionally

Driverless Metro Train

Kalpit Joshi
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai , India
sickes2468@gmail.com

Harshad Kolhe
Department of Electronics and Telecommunication Engineering.
Thakur College of Engineering and Technology
Mumbai – 400101, India
kolheharsh15@gmail.com

Neha Mishra
Department of Electronics and Telecommunication Engineering.
Thakur College of Engineering and Technology
Mumbai – 400101, India
nm27121999@gmail.com

Payel Saha
Thakur College of Engineering and Technology
Mumbai - 400101, Maharashtra, India
payel.saha@thakureducation.org

***Abstract*— Nowadays the modern technologies are helpful in all aspects of our life. Due to this lots of development done in the field of transportation. In the previous years, with the use of regular metro train accidents occur due to various reasons like the fault of the driver, signal errors and another major problem is, the human-operated metro train has no control over time, mean inaccuracy in time which affect the railway network management system. To solve this problem, we have a new concept of the driverless metro train. Driverless metro train improving the management system of the railway network, reduce human errors, consume less power and it provides comfort and safety to passengers during traveling.**

Keywords: Driverless, Metro train, IR sensor, GSM, RFID module, Arduino.

I. INTRODUCTION

This paper is developed to understand the technology used in the driverless metro train system which is mostly used by some other developed countries like Germany, Japan and France [1]. It solves the problem of mass transportation as well as the high transportation cost in the metro train system. It also reduces the energy consumption by 30% [2] of the metro train as it also uses the solar panels on the top for running the accessories of the train [5]. It also gives accurate timing control of the train on station arrivals and departures [4].

The operation of the driverless metro train is controlled by a central processor unit like Arduino controller, 8051 processor or PIC controllers [6]. The train is programmed to run on a predefined path which has fixed distance of stations and the speed of the train is also predefined and it is controlled by the motor driver IC. The stoppage of the train on the stations is also predefined. The RFID sensors and RFID tags are used for stopping of the train [1]. The whole operation of the train is controlled and performed by a controller so it does not require a driver or train attendant for the operation of the train [7].

This paper uses Arduino mega as the main controller of the whole system. The operation and control of the train are performed by the Arduino. The different operation

or functions of the train is carried out by fetching the programs in the Arduino by using the Arduino IDE software.

Some other additional features like LCD display to give messages to the passengers, GSM-based SMS facility to know the position or location of the train and give that information to the control center by SMS service [8], alarms to give indication to the passengers for LCD messages as well as for indication of door operation, automatic door controlling, passenger counting section by using IR modules [10], solar panels, MQ2 smoke sensor [9], vibration sensor [11], emergency brake button are also included in this paper.

II. SCOPE OF PROJECT

Driverless technology can improve punctuality & reduce ongoing operating costs, The benefits associated with ATO stem are consistent control of train speed profiles and greater potential for traffic management strategies to be implemented directly, Automatic Train Operation (ATO) can increase the frequency of trains, it offers a better recovery from delays, essentially an increase in the capacity of the system, Automatic Train Operation reduces the human error, and increases the safety of the system.

Automatic Train Operation (ATO) minimizes energy consumption for a given journey time by controlling the speed, including real-time optimization to take delays into account, smoother changes of acceleration compared to manual control may increase the lifespan of wheelsets and traction/braking equipment, and can also improve passenger comfort.

Automatic Train Operation can increase the number of trains, it can reduce the total fleet size, it can reduce the maximum rating of the electrical power supply system or major civil engineering structures, Driverless trains

can increase capacity not just on the trains but also the routes because of its automation.

III. PROPOSED METHODOLOGY AND BASIC WORKING FLOW

We have used Arduino Mega as the main controller. The supply of 5V to the Arduino is given by a source like power bank. All the components which are used for the different operation of the train are connected to the Arduino.

At first, the train will get supply from a source and gets ready to move. Here we have used the 12V battery for giving supply to the motor driver IC and door motor. But before that, the LCD will display the message that "The train will depart from the station in few minutes". The buzzer operates for every LCD message and for door operation.

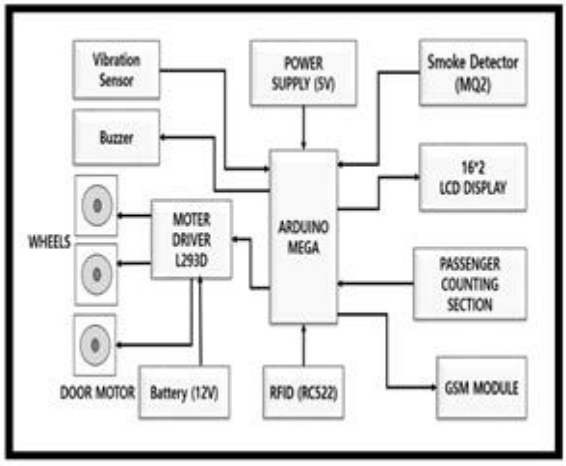
The passenger counting section came into action and count the passenger by use of IR modules and display it on the LCD. Then the LCD will display the message that "Doors are closing" with buzzer operation. The state of the motor is changed from off state to on state and the train starts moving and departs from the station. When the train is arriving on the station, the LCD will display the message that "Train is arriving on the station in few minutes" with buzzer operation. The state of the motor changes from on state to off state by use of RFID sensor and RFID tags. RFID sensor is fixed on the train and RFID tags are fixed near the station. By detection of RFID tags by RFID sensor, the train changes its state of motors from on state to off state. Then the LCD will display the message that "The doors are opening" and the door control will open the door. The whole operation of departure and arrival is repeated on every station during the train operation.

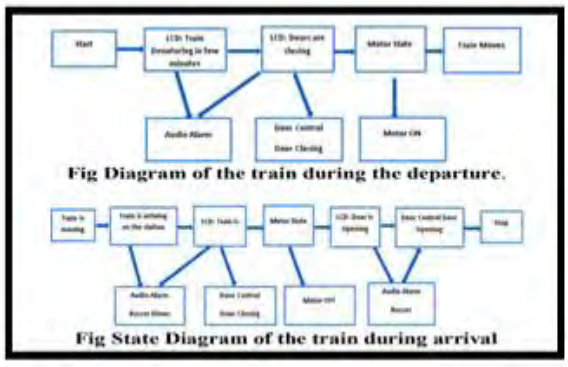
It also contains some additional features like GSM based SMS service. We can track the position of the train by using this system and send the information to the control center by using this service.

This train is having a solar panel on the top for running the auxiliaries of the train like LCD displays, mobile charging sockets, lighting, fans etc. The produced solar power can be converted into AC power according to the requirement by the inverters. The use of solar panels reduces the power consumption of the train.

It also includes smoke detection via the MQ2 smoke sensor for the protection purpose. When there is some problem in the train due to system failure or electric shocks, smoke is produced which is detected by the smoke sensor and give the signal to the Arduino for protection of the train. It protects the train against fire as well as short circuits in the train.

It also consists an emergency braking button placed on the train. It is used at the time of emergency for apply brakes on the train. We have also used vibration sensor for the protection purpose. When the emergency occurs in the train due to any type of failure, that causes vibration and so vibration sensor senses it and gives an indication to control center by GSM facility.





The system can be hacked, destination can be changed causing a danger to passenger's lives. PIC Microcontrollers were used to implement this automation but now we have Raspberry Pi and Arduino.

IV. LITERATURE SURVEY

The existing conventional signaling system most of the times relay on the oral communication which means the human existences, but there is large scope for miscommunication of the communication gap or the information due to a lot of human interference in the system. This miscommunication may lead to wrong allocation for the trains, which approximately leads to train collision. The statistics in the developing countries showing that 80% of worst collisions occurred so far is due to either human error or incorrect decision making through miscommunication in signaling and its implementation. A decision to implement driverless operation on a new or existing metro system requires the costs and benefits to be systematically assessed, the moderate passenger numbers is mainly done by IR sensors. Here Arduino is used as mini-CPU which controls the activities and even IR sensors are used to detect the upcoming stations as IR transmitter is placed near stations and IR receiver is placed in the train. The count of passengers and time limit is displayed on the LCD display; thus, technology transfer may therefore

have some potential to accelerate development and reduce the cost of these systems for the driverless train and also reduces the collisions and reduces the difficulty range to the passengers.

V. PROBLEM DEFINITION

By observing the all the different areas of the metro transport system maximum number of accidents are happening due to various errors which might be due to electricity failure or human error and some of the service of the driverless metro train need to be improved. The methods and technologies used for counting passengers and monitoring service are old.

Disadvantages of the existing system are manual service monitoring, manual passenger counting, more manpower is required, integration and installation is time consuming.

The proposed merits of the automated system are requiring less manpower, automated passenger counting helps in identifying significant passenger load points where service is excessive or deficient, assisting service planning and schedule adjustment, service monitoring technology helps to identify the system operations and tracking vehicle location and quality and adequacy of service, automatic train supervision (ATS), and automatic vehicle location (AVL) help in monitoring these trains.

VI. RESULT

Whenever the train arrives at a station, the IR line is interrupted and the train stops automatically. After the train is stopped the doors of the train will be opened and a buzzer will be blown indicating the passengers that the station is arrived.

Meanwhile the passenger counting section will count the no. of passengers present inside the train and displays it on an LCD screen. After a prescribed time set in the controller, a buzzer will be blown and the doors will be closed automatically. After a prescribed time set in the controller, a buzzer will be blown and the doors will be closed automatically.

The principal service issues that passenger counting technology has identified are the need to provide more service, to track changes in passenger demand, and to track on time performance issues. AVL in Auto Metro increases traffic control efficiency and improves customer service Information.

In Metro monitoring equipment for preventive maintenance, together with service monitoring, improves service reliability. The accuracy and abundance of data provided by service monitoring technology - be addressed. Reinforced by manual staff monitoring, monitoring technologies are enabling transit providers to provide more efficient and effective service. Especially ATS and AVL - help to determine what issues need to be addressed. Reinforced by manual staff monitoring, monitoring technologies are enabling transit providers to provide more efficient and effective service.

VII. CONCLUSION

Our driverless metro train project provides the unique features like it provide fully automatic driverless operation with less traveling time, less consumption of electricity, smoke detection etc. Driverless metro system provides better quality services as well as exact timings of the train for arrival and departure. It reduces the overall running cost of the system and by use of solar panels, it also reduces the power consumption of the train. One advantage of this system is to transport more people than the normal metro train services. This system makes a better way to build smart cities as well as to provide better metro rail services to the society.

VIII. REFERENCES

1. Bhosale Smita Vijayanand, Pansare Pooja Balaso, Shinde Pooja Sanjay, Prof. Sukeshkumar Borate, RFID based metro train system, International Engineering Research Journal (IERJ), Volume 2 Issue 8 Page 3008-3010, ISSN 2395-1621, April 2017.
2. Factsheet, how does a driverless metro system work? Siemens, Germany, Munich, April 2012.
3. A. Cartenì, I. Henke, M. I. Di Bartolomeo and M. Regna, "A Cost- Benefit Analysis of a Fully- Automated Driverless Metro Line in a High- Density Metropolitan Area in Italy," 2019 IEEE International conference on Environment and Electrical Engineering and 2019 IEEE Industrial and Commercial Power Systems Europe (EEEIC / I&CPS Europe), Genova, Italy, 2019, pp. 1-6, DOI: 10.1109/EEEIC.2019.8783471.
4. Efficient Real-Time Train Operation Algorithms With Uncertain Passenger Demands, Jiateng Yin, Student Member, IEEE, Dewang Chen, Senior Member, IEEE, Lixing Yang, Tao Tang,and Bin Ran, IEEE transactions on intelligent transportation systems.
5. Solar powered train, https://economictimes.indiatimes.com › Industry › Transportation › Railways
6. Full Automation in Driverless Trains: A Microcontroller-Based Prototype, Thabit Sultan Mohammed, Wisam Fahmi Al-Azzo, Mohammed, Ahmed Akaak, Mohammed Laheeb Suroor, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, ISSN (Online): 2278 – 8875, Vol. 3, Issue 7, July 2014.
7. Model-based development of an Automatic Train Operation component for Communication Based Train Control, Mariano Di Claudio, Alessandro Fantechi(*), Giacomo Martelli, Simone Menabeni, Paolo Nesi DISIT Lab, DINFO, Dep. of Information Engineering, University of Florence, Italy; (*) DINFO, University of Florence, 2014 IEEE 17th International Conference on Intelligent Transportation Systems (ITSC) October 8-11, 2014.
8. Requirements of GSM Technology For The Control Of High Speed Trains, CCsar Briso, Carlos Cortks, F. Jose ArquCs', JosC I. Alonsoz, ' Universidad Polit6cnica de Madrid, EUIT Telecomunicacibn, %a\ Valencia Km 7,2803 1, Madrid, Spain, Universidad Politkcnica de Madrid, ETSI Tei&imunicacion, Ciudad Universitaria sn, 28040, Madrid, Espaiia.
9. Automatic Fire Initiated Braking and Alert System for Trains, Sumit Pandey, Abhishek Mishra, Pankaj Gaur, Amrindra Pal, Sandeep Sharma #1Department of Applied Electronics and Instrumentation, 2015 Second International Conference on Advances in Computing and Communication Engineering.

This page is kept blank intentionally

Automatic Crack or Fault detection on Railway tracks using PLC

Swapnil Bhagat
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
swapnilbhagat047@gmail.com

Shivam Mishra
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
shivammishrarock89@gmail.com

Riya Singh
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
riyasingh2701@galil.com

***Abstract*— There is an expanding with the quantity of mishaps at railroad railings. Presently a days we utilize various sorts of transport offices like Track, transport, flight and vehicle and so forth yet over these offices we decided to go with rail in light of the fact that by going through the rail is modest, sets aside less effort to convey the our item, framework and it is the expense effective however the quantity of mishap on railyway track because of flaw on target and when any snag came before the train. This paper bargains around one of the effective techniques to dodge Train Collisions. Here we are utilizing PLC with SCADA framework for programmed control of vibration sensor and ultrasonic sensor, here vibration sensor is use to distinguish the deficiency on rail route track and ultrasonic sensor is use to recognize hindrance before the train. In the wake of identifying the deficiency plc will give data about the issue to the loco pilot in the train on the scada screen,as well as in charge room moreover. The fundamental segment are utilized in this venture are programmable rationale controller(PLC), scada screen, ultrasonic sensor, vibration sensor and so forth We are utilizing scada moniter on the grounds that it is the bidirectional information moving gadget it can show the yield of flaw and assist us with making a move concurring the issue on the track. With the assistance of this proposed project train can run on time during winter season on hazy condition and on night additionally where driver incapable to see anything. It tends to be useful for the Indian rail lines.**

Keywords—PLC, SCADA system, Ultrasonic sensor, Vibration sensor, GSM

I. INTRODUCTION

The fundamental target of this task is to give a sign or caution us that there is a breakage of railroad line or there is any article before the rail route track. In this proposed project, programmable rationale control (PLC) is utilized for multipal activity with a solitary gadget and activity of vibrating and ultrasonic sensor are controlled with assistance of plc. Vibrating sensor which is utilized to discover the identification of breakage in the rail line track. The Indian rail route network today has a track length of 1,15,000 kilometers over a course of 65,000 kilometers and 7,500stations. It is the fourth biggest rail line network on the planet surpassed exclusively by those of the US, Russia and China. In 2011, Indian railroad extended 8,900 million passengers‟ every year or in excess of 24 million travelers day by day and 2.8 million tons of cargo day by day. In spite of bragging such great measurements, the Indian rail network is as yet on the development direction attempting to fuel the financial requirements of our country. Despite the fact that rail transport in India is developing at a fast speed, the related security frameworks are not up to worldwide principles.

To exhibit the gravity of the issue, official insights say that there have been 14 mishaps in 2011, 15 mishaps in 2012. On additional examination of the components that cause these rail mishaps, late measurements uncover that roughly 90% are because of breaks on the rails either because of characteristic causes (like high development because of warmth). The current work is centered around cutting down the mishap rate via consequently distinguishing the breakage/s on the tracks. Ebb and flow advancements utilized in rail lines is simply the Counter Crash Gadget (ACD) is a self-acting microchip based information specialized gadget planned and created by Kankan Rail line .The framework comprises of Loco ACD with a reassure (message show) for the driver (in each Loco Motor), Watchman ACD with far off (fitted in Gatekeeper Van), Station ACD with comfort (fitted in Station Experts' Lodge), Monitored and Automated Entryways ACD with hooters and flashers (in every area) and Repeater ACDs (fitted at areas having hindrances in radio correspondence, for example, bumpy regions) which work in show to forestall the accompanying sorts of impacts and mishaps like-Head on crashes ,Backside ,Crashes because of wrecking, Impacts at the level intersection doors.

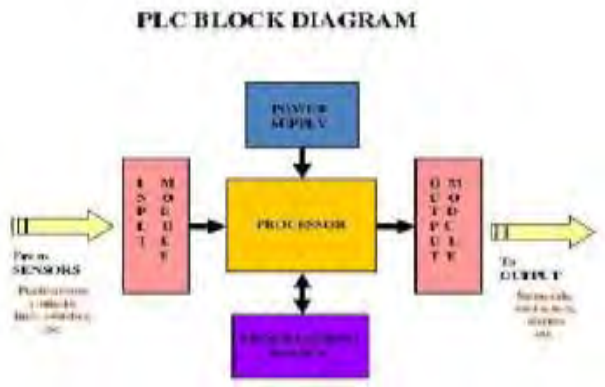
II. COMPONENTS

PLC :

A Programmable Rationale Regulator, PLC, or Programmable Regulator is a computerized PC utilized for computerization in this proposed project. These regulator are uniquely intended to get by in cruel circumstance and protected from heat, cold , residue and dampness and so forth PLC comprise of a chip which is customized utilizing the script. The program composed on PC and is downloaded to plc by means of

link. These stacked projects are put away in non unpredictable memory of the plc A visual programming language known as the stepping stool rationale was made to program the plc. Both sensor (Vibrating and ultrasonic senor) associated with plc. In this undertaking we required quick exchanging so this is the primary purpose behind utilizing plc . At the point when any breakage of rail line recognized by vibrating sensor unexpectedly plc will excursion and offer sign to us that there is breakage of line. Similerly in the event of Ultrasonic sensor , when any article come before train then plc will outing and give us a sign of any one is there before the train.

Programming a PLC is simpler than wiring the transfer control panel.PLC can be reconstructed. Customary controls should be reworked and are frequently rejected all things being equal. PLC takes less floor space at that point transfer control panels.A PLC has office for broad information/yield arrangements.Maintenance of the PLC is simpler, and unwavering quality is more noteworthy. PLC can be associated with the plant PC frameworks more effectively than a hand-off. PLC has not very many equipment disappointments contrasted with electromechanical hand-off.



Vibration Sensor :

A vibration sensor is a gadget that utilizes the piezoelectric impact, to gauge changes in pressing factor, increasing speed, strain or power by changing them over to an electrical charge. Vibration sensor dependent on the piezoelectric impact Change in opposition because of the power following up on it and converts it into 4 - 20 Mama. They're estimating contrasts in wavering and distinguish the vibration made When the hole in the track is recognized or when a running train is identified before the standing train, the sensors(vibration sensor and the hole indicator) sounds a caution which is fitted in the working room in the motor. This object sensor shows normal forvibration sensor.

Qualities of vibration sensor :

Ultrasonic sensors are utilized for material testing (to distinguish breaks, air bubbles, and different imperfections in the items), Article identification, position discovery, ultrasonic mouse, and so forth

The Current yield is between 4 Mama to 20 Mama with 2 hand-off yields and Sequential Interfaces. In this Opposite extremity assurance is utilized.

Alarm

In this proposed project we can utilized high solid caution and for show reason we can utilize SCADA representation. SCADA is a unique kind of show programming, which have bidirectional orders. Its can show yield in plain view and as indicated by the yield a fitting info order will give by the scada.

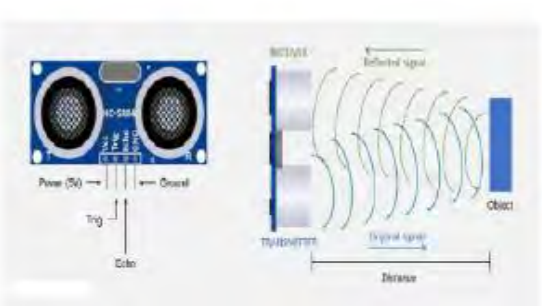
Vibration Monitor.

1. Measuring Range RMS: 0 to 25mm.
2. Switching outputs: Normally Closed and
3. Analogue 4 to 20ma.

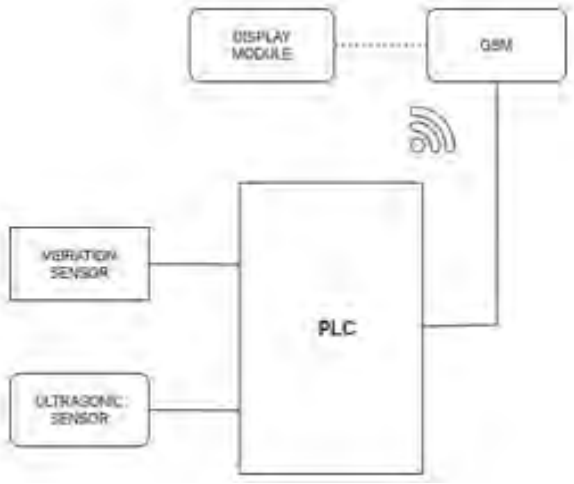
Ultrasonic Sensor :

Ultrasonic sensors radiate short, high- recurrence sound heartbeats at ordinary stretches. These engender noticeable all around at the speed of sound. In the event that they strike an item, at that point they are reflected back as reverberation signs to the sensor, which itself registers the distance to the objective dependent on the interval of time between radiating the sign and accepting the reverberation.

IR2 sensor shows the qualities of ultrasonic sensor in our model. As the distance to an item is controlled by estimating the hour of flight and not by the force of the sound.



BLOCK DIAGRAM



Here, The PLC is connected to 2 components-2 Sensors Vibration Sensor and Ultrasonic Sensor also the PLC is connected with GSM which will notify the loco Pilot as well as the station master at the most next station Also to note that the PLC will be mounted on 4 wheels which will work with motors

III. PRINCIPLE AND OPERATION

The head and activity is basic when any flaw happen in the rail line track like breakage of line anytime then vibrating will distinguish the expand and give us a sign about the issue. Issue can be see with assistance of alert and seen on the scada. Essentially when item came before the train then ultrasonic sensor will recognize the picture of article and give us a sign about the item as far as caution and can seen on the scada programming. In the given graph guess that IR1 is vibration sensor and IR2 is the ultrasonic sensor. Engine means the train motor.

IV. Result and Discussion

This Project will Improve the saftey and efficiency of the Indian Railways also it is very much cost efficient Firstly the PLC will be installed with program which will function the two sensors If there is any fault in the Railway line then it will automatically through GSM notify at 2 places - at the next station and the loco pilot This will alert the station attendant as well as it will allow Loco pilot to take First hand action.

V. CONCLUSION

The main favorable position of this proposed project is it gives data about the breakage of line to the loco pilot it and furthermore give data in the control room of rail line. As we realize that there is an enormous number mishap happen during winter season because of the mist so this undertaking is help to forestall any forswearing in the railroad.

REFERENCE

[1] Stefan et al, “HMM Based Segmentation of Continuous Eddy Current Sensor signal”, 11th International IEEE conference on intelligent transportation systems, china, vol.13, Page 760-765, 15 Dec 2008

[2] Raghupatty, Pranab, Dineshkumar, Bharath,” Automatic Rail Detection Using Ultrasonic Detector”, International Conference on Modern Trends in Signal Processing, 2012.

[3] Douglas et al, “Detection of Broken Rotor Bars in Induction Motors using Wavelet Analysis”, IEEE, Vol.42, Page 923-928, 2003.

[4] Chellaswamy, C., Arul, S., Balaji, L., “Design and analysis of an intelligent collision avoidance system for locomotives” ,Sustainable Energy and Intelligent Systems(SEISCON 2011).

[5] S. Ramesh,”Detection of Cracks and Railway Collision Avoidance System”, International Journal of Electronic and Electrical Engineering ISSN 0974- 2174 Volume 4, Number 3 (2011), pp. 321-327

[6] Bhatt, Ajaykumar A, „An Anti-Collision Device (ACD) Network – A train Collision Prevention System (TCPS)“.

[7] Indian railway vision 020.Government of India, Ministry of Railway, (Railway Board) December 2009

[8] A concept for reducing railway accidents. H Ben Brown, Jr. Gregg Podnar, Mel Siegel, February, 2005.

[9] Mr. N. Sambamurthy et al Int. Journal of Engineering Research and Applications ISSN : 2248-9622, Vol. 3, Issue 6, Nov-Dec 2013, pp.1592-1597

[10] IJREAT International Journal of Research in Engineering & Advanced Technology, Volume 1, Issue 1, March, 2013

This page is kept blank intentionally

Animal Adoption Website Design

Tanishka Khatik
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
swtnikki14@gmail.com

Sweni Doshi
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
doshisweni@gmail.com

Shlok Bhagat
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
bhagatshlok1412@gmail.com

***Abstract* — Animal adoption is the process whereby a person brings an animal, mostly cats and dogs, to their own care. These animals that are either lost or abandoned are taken by the animal control to be kept in animal shelters. Because of very real practical constraints, conditions in animal shelters are often reminiscent of those in early primate deprivation studies. Dogs are frequently surrendered to shelters because of behavior problems, and aspects of the shelter environment may induce anomalous behavior, increasing the chances that adopted dogs will be returned to the shelters. Comparative psychologists, psychobiologists, and other behavioral scientists possess the knowledge and techniques to help shelters intervene in this cycle. Experience suggests human interaction and the application of basic conditioning procedures can reduce the impact of the shelter environment, and ease the transition into the adoptive home. A program developed to meet these goals is described. Shelters can provide opportunities both for the training of students in animal-related exercises and for limited applied research. Behavioral scientists stand in a unique position to help transform conditions in animal shelters to the benefit of all involved. The inspiration of this project is a web-based adoption site for people to be more aware of stray animals waiting to be adopted in various shelter homes. The website is accessible for users and administrators where users can register themselves into the system to view the list of animals waiting to be adopted along with each animal's records such as their (estimated) age, gender, and their description. The administrators are the main authority of the system and they are responsible for adding, editing, updating, and deleting information if necessary. The user has to give details about his/her income , job description etc. to ensure the pet is in safe hands. The data will be verified by admins and the decision will be taken whether the individual is eligible for pet adoption. After adoption of the pet the owner has to upload health checkup certificates which will also be verified by admins to ensure safety of the pet.**

I. INTRODUCTION

Most necessary things for a website is selecting a programming language. Mostly web design using HTML and CSS. For web designing not necessary high level knowledge of HTML. We can say features like as webpage formatting, designing, page layout techniques, graphics, multimedia, images and functions of multipage website should be including. After programming language to see the layout of webpage should a test server. The reason behind is developer is using programming language, if will be the expert of language but still running often these mistakes cannot be found, there is a need to execute server side coding to see the preview by a test server. Writing of contents is a significant part of development of web pages and plays an important and necessary step in optimization Engine, a well-defined or easy content is utterly necessary to fall in internet site users. Content written by a more professional requires more pure, easy and accurate content. Coding start of a Web Pages in CSS, HTML, Java scripts and other technologies of WWW (world wide web), for drawing of the graphic and text contents, we look code of web page consistently like as webpage design. Coding of a web page is loading quickly search engine and index give us rank very quickly. Every web page of a website takes a unique title, unique meta tags as keywords and descriptions. We can create links of internal with keywords of website to explore the search engine ranking and navigation. In this way improve the website quality code by using techniques and tools according to website standards.

II. PROBLEM DEFINITION

Most shelter animals have a reputation of being aggressive animals that roam around the streets and are taken in by the animal control because of their wild behavior. Therefore, the project has focused on presenting the user with each animal's personality descriptions to gain the user's interest to adopt the animal. When an animal is adopted by a person, most organizations do not take caution on whether the animal is taken in by good hands. Therefore a personality evaluation must be taken before someone adopts an animal. Animal adoption shelters usually ask the adopter for their contact information but never actually keep in contact with the people who adopt the animals, especially when their records are difficult to retrieve because they are kept as hardcopies.

III. MOTIVATION

Buying a dog from a pet store, online seller or flea market,you're almost certainly getting a dog from a puppy mill. Puppy mills are factory-style breeding facilities that put profit above the welfare of dogs. Animals from puppy mills are housed in shockingly

poor conditions with improper medical care, and are often very sick and behaviorally troubled as a result The moms of these puppies are kept in cages to be bred over and over for years, without human companionship and with little hope of ever joining a family. And after they're no longer profitable, breeding dogs are simply discarded—either killed, abandoned or sold at auction. These puppy mills continue to stay in business through deceptive tactics — their customers are unsuspecting consumers who shop in pet stores, over the Internet or through classified ads. Puppy mills will continue to operate until people stop supporting them. By adopting a pet, you can be certain you aren't giving them a dime. The number of euthanized animals could be reduced dramatically if more people adopted pets instead of buying them. When you adopt, you save a loving animal by making them part of your family and open up shelter space for another animal who might desperately need it.

Animal shelters and rescue groups are brimming with happy, healthy pets just waiting for someone to take them home. Most shelter pets wound up there because of a human problem like a move or a divorce, not because the animals did anything wrong. Many are already house-trained and used to living with families.

The pre-existing websites of pet adoption are not much concerned about the pet after adoption is done. This project concentrates more on animal health, after adoption the adopter has to submit pet health certificate on monthly basis. A database will be created which has all the data and can be verified by the admin to avoid fake users. The adopter has to fill adoption form which will be verified by the admin and then the pet adoption rights will be given to the adopter.

IV. LITERATURE SURVEY

We went through many sites for our references, but three of them were the main reference point for our website. First we went through Petfinder website , that website is for pet adoption and it was created very nicely , gave us ideas for our website , it gave us the idea to filter out the user search by breaking it into respective categories of pets , like age ,colour etc. Then later on , we searched through adopt a pet website where you have to put in your location , and pets found in their vicinity is presented before them , and if not they direct you to other link , we liked the idea and was very user friendly , that's why we adopted that idea for our website making And lastly the shelter project , that website gave us a basic idea of how the website should look like in order of decor , and the home page and what brings in more customers and how the adoption process should carry forward , therefore all these websites gave us references and suggestions for our website.

V. PROPOSED DESIGN

The front end is designed in such a manner that users won't face any kind of difficulty in locating the options. The proposed system uses features of CSS, JAVA Eclipse, HTML, JAVASCRIPT, MySQL Database.

It incorporates CSS design and Material UI features to provide aesthetic to the web application. As the number of users increase, the amount of data to be stored, processed and update will increase tremendously. Hence major chunk of cost involved in project will be purchase of cloud storage.

The basic approach was to design the front end in such a manner that it supports good UI/UX simply by help of open source technology.

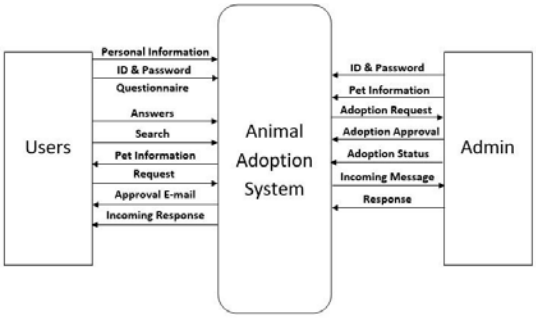


Figure 1. Data flow diagram

Figure 2. Home Page

The Home Page shown in figure 2, is the default page of the web application. It will show various breeds of dogs registered on the website and after selecting the dog breed redirect the user to their profiles.

The next webpage is Signup page. It's the first page with which user interaction begins.

Every new user will be required to provide data such as email, password and other details. These will be basic credentials which will be used used for authentications at later stage. Our admin checks whether the email address given as input by user matches the standard used for authentications at later stage. Our admin checks whether the email address given as input by user matches the standard email format or not. The Signup

process is deemed successful only when email is correct and input of password and confirm password matches with each other.
The next web page that we have created is Login page. It will act as an intermediate between authentication and user data layer. The access to profile is granted only if user enters the correct credentials.

Figure 3. Login Page

It will be supported by authentication method from mysql database which will ensure data security.

VI. RESULT & DISCUSSIONS

The front end of the web application was successfully completed using java eclipse and supporting frameworks. It consists of a navigation bar that has three basic options – Login, Admin login and Create account. Hence it provides the facility to user to access them. The navigation bar has been developed in such a manner that once a user successfully logins in his profile, it is no more available. Hence navigation bar is part of authentication layer. Once the authentication is completed, it is automatically disabled by the code.

VII. SCOPE OF PROJECT

User registration
This function allows the user to register as a member to interact with the system. The system requires the user to log- in before going through other processes.

User must answer the questionnaire
After registering into the system, it is mandatory for the user to fill in the questionnaire about their background, interests, life style and history of raising a pet.

Data is input and updated by the administrators
All animal's records are input and updated by the administrators. Animal records such as their name, breed, gender, approximate age, coat color and size.

View information online
The user can view the records of animals in the shelter by going through categories and lists; our system has two categories: Dogs and other animals. The user can also view information about the shelter and also where to contact the shelter.

Adoption requests
The user can select the animal they want to adopt and send a request through the system which will then notify the administrator of a new adoption request. The administrator will have to review the questionnaire the user has previously answered to see whether they are capable of adopting an animal or not.

E-mail notification
After reviewing the questionnaire, the administrator will send an approval E-mail through the system to the user whether they meet the qualifications of being a decent pet owner or not.

Adoption confirmation
The administrator can confirm to the system whether the user has come to adopt the animal or canceled their adoption request.

Recording adoption records
The system has a database of past adoption records along with the user's contact information which can only be viewed by the administrator categories: Dogs and other animals. The user can also view information about the shelter and also where to contact the shelter.

VIII. CONCLUSION

Adopting a pet while without realizing the commitment needed to properly take care of the animal is a commonly seen and growing issue in today's world. This project aims to specifically grant adoption permission of pets to people who are capable of taking proper care, and help reduce the number of pets adopted by irresponsible people, thereby reducing the number of pets that end up back in a shelter or on the streets. Through the use of a responsive website, potential adopters will be screened via a questionnaire in order to make sure they are in a position to properly take care of an animal as well as to educate them about the responsibilities involved so as to avoid any misinformation which may lead to returning or abandoning their potential future pet. To not also forget the problems caused by the silent animals on the streets, it's almost daily we see that animals on the street are so helpless and are centre of all the nurture and affection from us. We are confident that by following the implementation outlined in this document, we will be able to create a system that can be used to providing an abandoned animal with a dream home so it will never be abandoned again.

REFERENCES

[1] American Humane. (2010). Animal shelter euthanasia fact sheet. March 10, 2010 http://www.americanhumane.org/about-us/newsroom/fact- sheets/animal-shelter-euthanasia.html
[2] Shelter Pet Adoption Research http://chewonthis.maddiesfund.org/wp- content/uploads/Shelter-Pet-Research_Jan-21-14.pdf
[3] Animal Ethics and India Understanding the Connection through the CapabilitiesApproach By Rhyddhi Chakraborty

Kitchen Waste Management Website

Rishab Pandey
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
rishabpandey19@gmail.com

Akshat Rathod
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
akshatrathod28@gmail.com

Swapnil Yadav
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
swapnilyadav718@gmail.com

***Abstract* - The project is basically designed for those who want to conserve kitchen waste and know the effective ways to reuse it. The project makes it easier to classify the different types of waste for the user. The project will provide information about a particular waste in a certain category i.e. regarding the way to reuse it and if not conserved what all effects will it cause when wasted. We have also created a tips and tricks page which gives an idea how to reduce everyday waste. In case the user wants to add input from their side then they can be a member by registering on our website and then be able to add info from their side.**

Keywords— Database, Kitchen waste, Covid 19, Java, Web application, JDBC,MySQL

I. INTRODUCTION

Java is the most widely used technology to design web applications since last decade. It's based on MVC architecture that uses Spring Hibernate ORM framework. While there is no denying that Java is efficient and powerful tool but it cannot meet the ever changing needs and requirements of modern technology.JSP helps us to design and develop the product at one place rather than doing the task separately it also helps us to use request response model with connection to database for smooth functioning of the website.Use of Mysql to store data helps us to use the data in later parts of the website.

II. PROBLEM DEFINITION

To create a dynamic website which will make the users know about the different ways to conserve the kitchen waste and will also make them realise about the reason i.e. why they should not just throw away the waste accumulated in the kitchen, which when reused can indeed be of great significance and also the user will be able to provide significant ways to conserve the kitchen waste form his/her side.

Login and registration . These two pages should be part of the authentication layer. Each of them should be accessible through options on the side navigation bar. The Signup page should ask the client for data and provide a facility to create a unique username (combination of string and integer) which can be later used to login. The home page should provide options to login as well as fetch recent updates from other users. On the basis of this database can be designed in the firebase in higher semesters.

III. MOTIVATION

As we all know that most of the websites focus more on the conservation of certain type of kitchen waste or conservation of any waste material under a certain type of kitchen waste and it becomes very difficult for the users to get information about different types of kitchen wastes from a single website, so they have to switch to different websites to get information about different kitchen wastes and hence it becomes necessary to have a website that can provide the user with all the information relating to conservation of any type of the kitchen waste the user wants to know about, which will eventually save the time of the user and also provide him/her with the best information possible. Also, a lot of the websites are static in nature, wherein the user can only see the information provided by the web administrator, so there are no interactions between the user and the web administrator, and therefore a dynamic website is needed in which the user once logged in can provide information to the website from their side which will eventually benefit the other users as well as the website in expanding the information it provides.

IV. LITERATURE SURVEY

Rakholiya Kalpna, Kaneria Mital and Chanda Sumitra in their paper dated 04/January/2011 "Vegetable and fruit peels as a novel source of antioxidants" discussed Consumers are currently demanding less use of chemicals or minimally processed fruits and vegetables, so more attention had been paid to search for naturally occurring substances. This is particularly true for plant materials that act as alternative antioxidant sources,thus kitchen waste being an important source of nutrition to plants as well as humans."

Susan M. Mitchell Information Systems Department, University of Maryland, Baltimore, USA and Carolyn B. Seaman,Information Systems Department, University of Maryland, Baltimore, USA in their paper dated 06/November/2009 writes "A comparison of software cost, duration, and quality for waterfall vs.

iterative and incremental development: A systematic review to adapt the methodology for the project."

V. PROPOSED DESIGN

The front end is designed in such a manner that users can get basic idea about kitchen waste management and can classify the types of kitchen waste i.e. Wet Waste, Dry Waste and Electrical Waste. It incorporates CSS design and Material UI features to provide aesthetics to the web applications. As the number of users increases, the amount of data to be stored, processed and updated will increase tremendously.

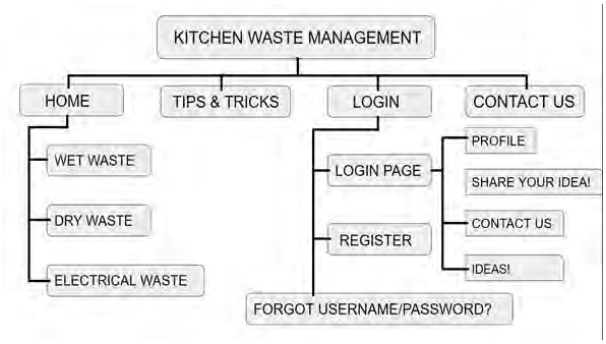


Figure 1. Data flow diagram

VI. RESULT & DISCUSSIONS

The front end of the web application was successfully completed using JSP and html . It consists of a navigation bar that has three basic options – Login, Home and Sign up. The navigation bar is visible on each of these three pages. Hence it provides the facility to users to access them. The navigation bar has been developed in such a manner that once a user successfully logins in his profile, it is no longer available. Hence the navigation bar is part of the authentication layer. Once the authentication is completed, it is automatically disabled by the code.

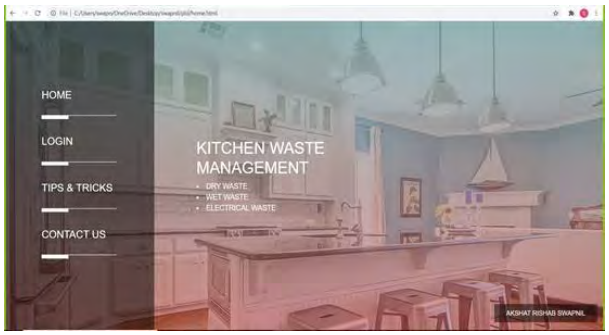


Figure 2. Home Page

The Home Page shown in figure 2, is the default page of the web application. It will show various user profiles registered on the social web as well as their latest post. It will also provide a direct login and signup option.

The next webpage is Signup page. It's the first page with which user interaction begins. Every new user will be required to provide data such as email, password and mobile number. These will be basic credentials which will be used for authentications at a later stage. While developing this page we have taken special care to check the validity of email addresses provided by users. Our code checks whether the email address given as input by the user matches the standard email format or not. The Signup process is deemed successful only when email is correct and input of password and confirm password matches with each other. While these things can't be demonstrated just at this stage but keeping database design in mind, we have already created provision for that in our front-end code.

Figure 3. Tips & Tricks Page

The next web page that we have created is the Login page. It will act as an intermediate between authentication and user data layer. The access to the profile is granted only if user enters the correct credentials.

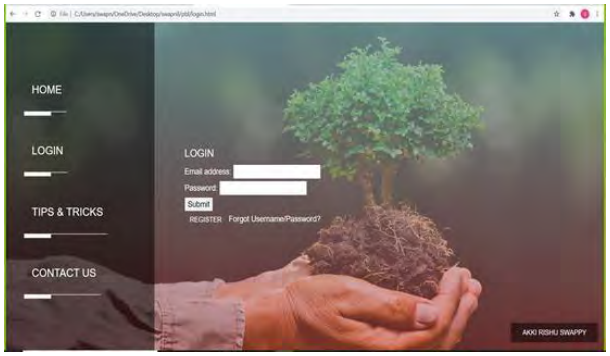


Figure 4. Login Page

It will be supported by an authentication method from firebase database which will ensure data security. We have used firebase security so that features like login using Facebook, Twitter or via OTP can also be added in future. Firebase cloud database will provide an efficient authentication layer to ensure security.

VII. SCOPE OF PROJECT

To develop an open platform where users can contribute new ideas and discuss . Provide users to share knowledge on kitchen waste management. Will help to decrease the amount of waste generated that ends up in landfills.

VIII. CONCLUSION

This project was successfully implemented with all the features. Software used for the project are Visual Basic, MySQL ,Apache TomcatEclipse.

Languages used for the project are HTML and CSS and Java and The dynamic web application was tested on Apache Tomcat server.

With the help of HTML we were able to create the front end of the website as well as the base.With the help of CSS we were able to give a better look to the website. With the help of Java we were able to make the website more interactive and JDBC helps us to make our website dynamic by having data stored and relevant data displayed on screen. The website gives us the opportunity to classify the type of waste(i.e wet ,dry, and electronic waste).

REFERENCES

[1] https://www.w3schools.com/html/
[2] https://www.w3schools.com/html/html_basic.asp
[3] https://www.apachefriends.org/download.html
[4] https://www.mysql.com/
[5]https://www.oracle.com/in/java/technologies/javase-downloads.html
[6] https://www.javatpoint.com/ JDBC Tutorial
[7] Github Project repository link: https://github.com/Rishabrp99/kitchen-waste-managemet

This page is kept blank intentionally

Online Bookstore for Used Book

Rahul Singh
Department of Electronics & Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai, India.
Rsingh17032000@gmail.com

Shivam Singh
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai, India.
Shivamt7x@gmail.com

Shravan Singh
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai, India.
Shravansingh900@gmail.com

Purnima Chandrasekar
Assistant Professor,
Department of Electronics & Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai, India
purnima.chandrasekar@thakureducation.org

***Abstract* - People don't find easy platform to buy useable used books or get rid of useable used books without recycling , not storing those books properly will leave those book vulnerable to mouse and termite attack. To help people with this problem, we suggest follow system for online bookstore. The goal of this paper is to create system for an online bookstore for used books. Where users could interact to buy or sell used book. This will help users to sell books they don't want which will help another user to buy a secondhand book cheaper than the new one without having to waste time by searching it in many marketplaces. The System was implemented as a database for Backend development and HTML(PHP) as a frontend for users.**

Keywords:- Database, PHP, CSS, JavaScript.

I. INTRODUCTION

PHP is a general-purpose scripting language commonly used for creating dynamic web pages and implementing Database. To include diversity, we included JavaScript has secondary scripting language. CSS(Cascading Style Sheets) was used for Designing Website. CSS helps in creating responsive websites. Responsive web design (RWD) is an approach to web design that makes web pages render well on a variety of devices and window or screen sizes .The main purpose of creating online bookstore was to provide platform user to buy and sell used books.

II. LITERATURE SURVEY

Books help us pass knowledge from generation to next generation. As we all know that books are made from trees and many other materials which are in one or other form are responsible for degradation of our environment.

Recycling of books and Reusing it has been part of human life since decades. After reader/students are done with books they are either stored in house to be sold later(which are in danger to destroyed by attack by termites, mice, etc.) or sold/thrown for recycling, for packing snacks at shops or given to the relatives who will use them until they decide the fate of the book. People are only left with option to either give useable used book for recycling, or they give it to someone for reuse. In recycling mainly, the best is not come out of the available material which we can get if we reused the same material. People also take interest if they get the same amount of money for the same material.

Now everything is online as this era is full of Technology everything is online. So, now if all this things can be done online then it will be more easy for people to sell or buy i.e. whatever they were doing around them in their area now they will be able to connect with those people also who are not in their contact. There are lot of online bookstore on internet that provide option to exchange used book for new one but after carefully examining the used book for torn pages and others. Due to recent increase in internet usage in India[1] and 2019 Covid-19 Breakout, more people prefer to buy things online which has given opportunity for ecommerce business to rise[2] and is slowly weakening traditional market.

E-commerce sites have to deal with logistics like shipping, storage, keeping stocks, etc. To deal with such logistics price, e-commerce site mostly tries to get, and resale used books which don't have much wear and tear. In this process only few people are able to sell book and get few money back. Several problems with ecommerce sites sell book option is kind off limited to use like book must be in proper condition, no wear and tear and only few genres of book can be resold. The current system would be benefitted with allowing users to sell books to the users who is ready to pay for book with limited wear and tear which will help buyer to find book cheaper then new one and seller can get rid of book that they were going to throw away. The proposed system allows seller to get some of the money back when selling books online.

III. PROPOSED SYSTEM

The Web System will consist of Online Bookstore, Integrated Payment System and Chat System. In Online Bookstore, User will be able to create Post for Book. They can also view other book that are posted by other users. Using Chat, Buyer can contact Seller and Negotiate the price. Payment system could be integrated at later stages after verification by service provider. We are also ready to provide only Online Bookstore.

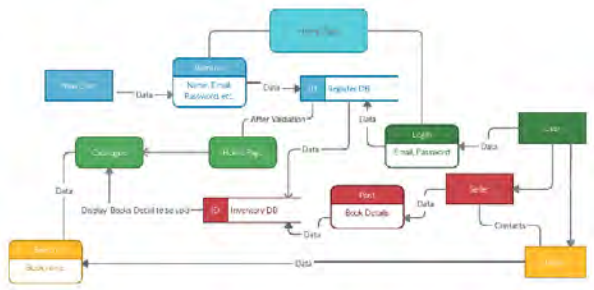


Figure 1: Data Flow Diagram

When new user arrives at website, they land at home page where they get to option to either login or register. When user registers that data is stored in Register DB. When users log in, the entered data is compared and verified with Register DB. If there is data mismatch, user is redirected to login page asking them to enter correct details. If entered data is same has Database, they are allowed access to their account where they can create post to sell books and also view complete inventory and seller's contact info. When Logged in user(Seller) create post the entered data is send to Inventory DB. The same data is shown in home's Catalogue section with seller name and phone number. Logged in user(Buyer) can browse through catalogue or search for required book. After they find required book, they can contact seller and discuss regarding price, delivery and other details. Used during implementation[3] [4] [5] [6].

IV. SCOPE OF SYSTEM

The System of 'Online Bookstore' is developed on PHP and JavaScript mainly. JavaScript was used for implementing further steps of system like Chats. Hence one can say that this technology is going to stay for long time along with new improvements and features. The system meets the need of any organization that is looking for a dedicated online bookstore or any type of online store. It can handle large amount of unstructured data hence it won't give rise to any performance issue. The web application incorporates PHP that is capable of handling database connection and displaying database.

The current web system consists of Login system and catalogue system. Login system allows user to create accounts, access info regarding books and book seller and start chat with seller. Catalogue Section allows user to view book info in list format.

The proposed system could be further improved by adding verification and review system for users, chat for communication between buyer and sellers, improved User Interface and searching algorithm and automated customer care service.

V. RESULT AND DISCUSSION

Visual Studio Codes was used as IDE. HTML, CSS was used as Front-end Development and PHP was used for server-side Development. System consisted of 7 HTML- PHP pages with internal CSS script. First Database was used for Registration and Login verification and Second Database was used for Inventory Management.

Since Books are made using paper and production of paper involves cutting of trees. To lower production of paper, we must recycle, reuse books. Reusing/giving used book to others is best way to extend books life. Since we live in era of faster communication, we can create ecommerce website for used books. This system attempts to create platform for buy and sale of used books.

The Website was successfully created to be user friendly and reliable. System was created in such way that user will not have hard time going through website. The website design is very easy to follow. The design has been developed in such a manner that it is minimal and efficient. Website consisted of Home with Catalogue section, Login, Registration and Profile page.

The main goal of this paper was to suggest a system for online bookstore. The system we implemented consisted of two section

i. Registration and Login Section – When User uses website, they can see and search books but if they are not logged in, they will not be able to see seller's contact info. When user register and logs in they can also create and post about book they want to sell.

ii. Catalogue Section – Here all the available books are shown. If users have hard time finding books from catalogue list, they have option to search. The system also has two database to manage above section's data.

Home page will have catalogue section where users can see books. If user is not login/registered, Login and Register Button will appear. When User has logged in, instead of login and register option username and (other option) will be displayed. When users click on Create post, they will be sent to create post form using that they can put their book on sale.

Some of the ScreenShots of end result:

Figure 2: Login Page

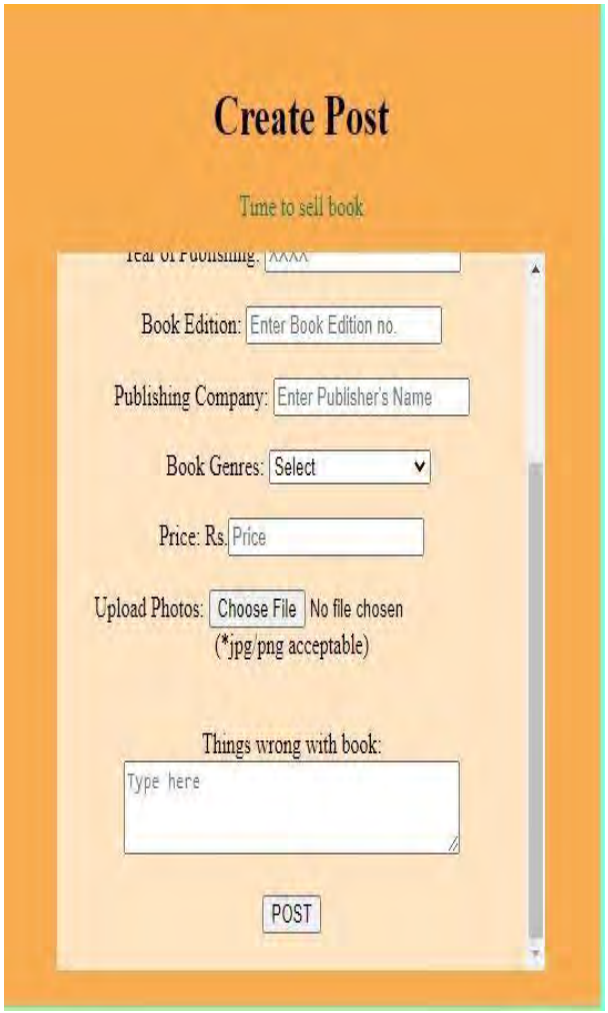


Figure 3: Create Post

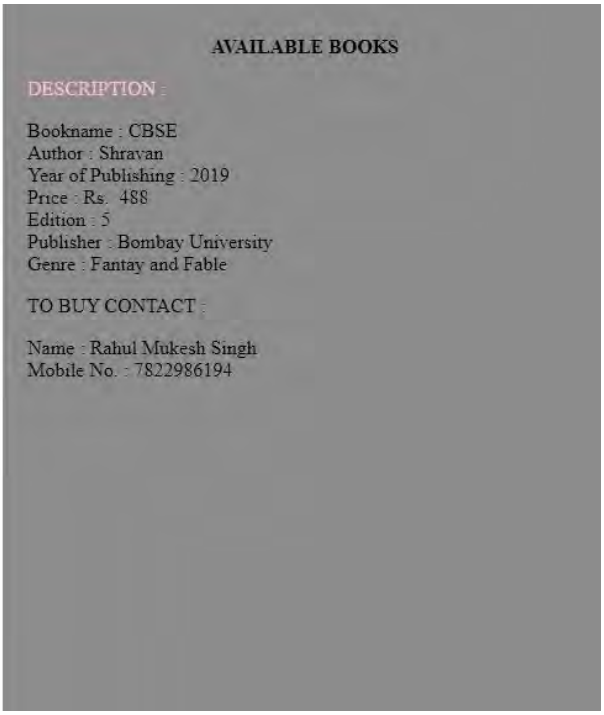


Figure 4: Search Result

VI. CONCLUSION

The front end and part of Backend of the dynamic web application has been successfully completed under Project Based Learning (PBL) – Semester III. It has been designed and developed on PHP and JavaScript to make it efficient and powerful. The front end has been designed in such a manner that schema of database can be implemented without causing a lot of hindrance to the front end. The design has been developed in such a manner that it is minimal and efficient, hence taking care of UI/UX.

The front-end views now need to be linked to backend database which will be based on cloud platform. The social web application will generate unstructured data in form of text, numbers and images. Database was managed by phpMyAdmin. The database should be such that it provides facility to create, read, update and delete large amount of data. After linking with cloud database, the web application can be hosted over any domain.

REFERENCES

[1] McKinsey Global Institute Digital India March-April 2019 Report(Online) https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/Dgital%20India%20Technology%20to%20transform%20a%20connected%20nation/MGI-Digital-India-eport- April-2019.ashx
[2] A Study on Impact of e-commerce on India's commerce Publisher: International Journal of Development Research Vol. 6, Issue, 03, pp. 7253-7256, March 2016
[3] Stack Overflow, Available(Online) : https://stackoverflow.com/
[4] W3schools, Available(Online) : https://www.w3schools.com/
[5] free Code Camp, Available(Online) : www.freeCodeCamp.com/
[6] Javatpoint, Available(Online) : https://www.javatpoint.com/

This page is kept blank intentionally

Hangman Project

Aayush Gupta
E&TC
Thakur College of Engineering and Technology
Mumbai, India
aayushgupta1018@gmail.com

Rishabh Kakani
E&TC
Thakur College of Engineering and Technology
Mumbai, India
rishabhkakani720@gmail.com

Yash Pandey
E&TC
Thakur College of Engineering and Technology
Mumbai, India
yashpandey2202@gmail.com

***Abstract*— This code is about a game of guessing the words and testing your memory. A list of words will be displayed to the player for 10 seconds and then he will have to guess the word from the list. The player will be given 6 chances max to guess the correct word from the list. If the user fails to guess the correct word in the number of chances given he loses the game and the game ends over there.**

I. INTRODUCTION

The word to guess is represented by a row of dashes, representing each letter of the word. In most variants, proper nouns, such as names, places, and brands, are not allowed. Slang words, sometimes referred to as informal or shortened words, are also not allowed. If the guessing player suggests a letter which occurs in the word, the other player writes it in all its correct positions. If the suggested letter does not occur in the word, the other player draws one element of a hanged man stick figure as a tally mark. The player guessing the word may, at any time, attempt to guess the whole word. If the word is correct, the game is over and the guesser wins. Otherwise, the other player may choose to penalize the guesser by adding an element to the diagram. On the other hand, if the other player makes enough incorrect guesses to allow his opponent to complete the diagram, the game is also over, this time with the guesser losing. However, the guesser can also win by guessing all the letters that appear in the word, thereby completing the word, before the diagram is completed

II. LITERATURE SURVEY

1. The following paper is about the game hangman. It is a basic coding game for students who are about to learn python coding. It contains various conditional statements and loops in it making the game interesting for the students.
2. The game is to guess the word from a given set of list. There would be 7 chances given to each user to guess the correct word. If the user gets the letter wrong each wrong attempt reduces the number of chances it has.
3. The word chosen will be random from the list. The list contains all the similar type of words making it a bit easy for the user to guess the game For e.g., The list will contain all the words referring to color or fruits etc.
4. Each wrong letter takes the game further by drawing the next step in the hangman. Once all the 7 chances are completed the game ends showing the complete diagram of hangman.

III. PROBLEM DEFINATION

- Python is a high-level language as we all know and its emerging as the most used programming language.
- The coding is made easier as well as it does not need much of coding lines compared to other languages.
- This project is for beginners learning to code in python and give them a little brief about using strings, loops and conditional statements.

IV. PROPOSED METHODOLOGY

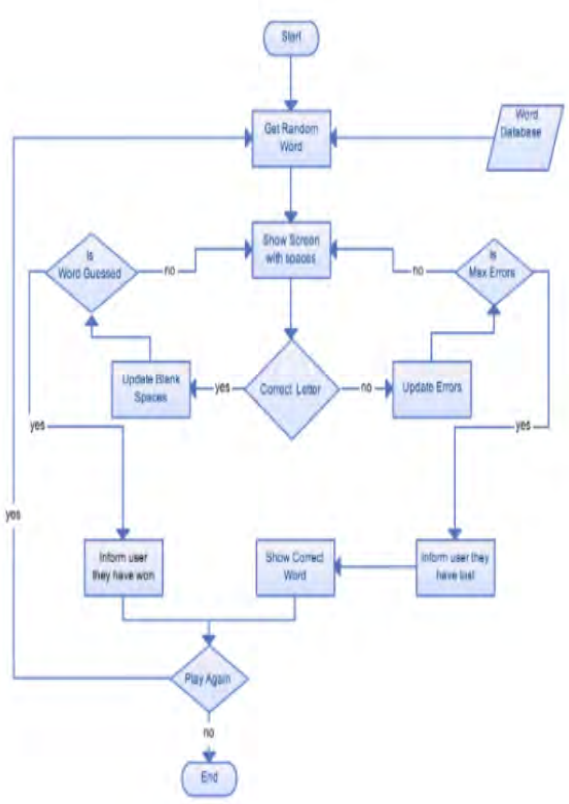
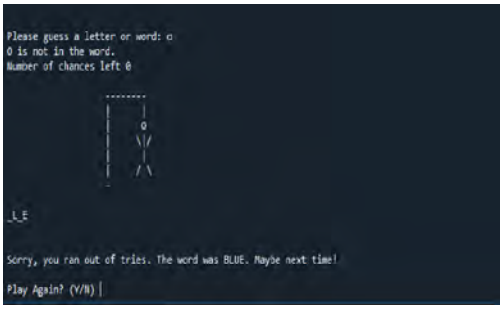


Fig 1: Flow Chart

V. OUTPUT



VI. CONCLUSION

We have used python programming language for the following project. Use of various loops such as for, while, if is being done in the code.
We have made a function which allows us to enter the letter only once throughout the game(If you enter the same letter again it shows the letter is already entered).Some commands such as isalpha is used which checks if the letter enter is a alphabet or not.

VII. ACKNOWLEDGMENT

We would like to thank E&TC department and our faculty members for giving us this opportunity to research and design project. Final thanks to Thakur College of Engineering and Technology for giving us this Platform.

REFERENCES

[1]https://youtu.be/m4nEnsavl6w

[2] http://www.youtube.com/hey

[3]https://stackoverflow.com/questions/61439927/python-hangman

[4]https://www.pythonforbeginners.com/code-snippets-source-code/game-hangman

[5]https://inventwithpython.com/invent4thed/chapter8.html

[6]https://www.geeksforgeeks.org/python-program-for-word-guessing-game/

Weather Monitoring Website (WeMo)

Anuj Maheshwari
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
anujpnmaheshwari@gmail.com

Shara Yasmin Ahmed
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
sharayasmin2k@gmail.com

Shruti Chaube
Department of Electronics andTelecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
shrutichaube27@gmail.com

Dr. Payel Saha
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
payel.saha@thakureducation.org

***Abstract*— In today's world, websites need to be precise as well as well constructed with right styling. Current weather update and monitoring sites lack an intuitive UI/UX and are either too complex or messy or very rudimentary- lacking depth and real updates. These sites often fall victim to slow loading times and inactive embed links. They can also have outdated or incorrect information with poor representation. Any new users are thus discouraged from visiting such sites. The website developed in our project as a way to bridge this gap bringing a clean front end to display accurate and in-depth data to users. By utilizing abstraction, we plan to reinvent the design of the site while still maintaining highly accurate and precise data values. WeMo - The Weather Project is a weather monitoring which provides daily weather updates, 5-day forecast, location-based weather maps and top headlines of the hour.**

Keywords*— *Weather Monitoring website, HTML5, JavaScript, JSON, MySQL, CSS3.

I INTRODUCTION

Weather monitoring is also important not just in defining present climate, but also for detecting changes in climate and providing the data to input into models which enable us to predict future changes in our environment. Weather affects a wide range of man's activities, including agriculture, transportation, and leisure time. Modern weather monitoring systems and networks are designed to make the measurements necessary to track these movements in a cost-effective manner. Modern technology has allowed the combination of several sensors into one integrated weather station that can be permanently located at one site, or transported to a site where localized weather is needed. The data collected from such stations are often displayed on websites with outdated and un-friendly user interface making it difficult for a typical user to get information they need with ease. Thus, our project worked with three main objectives in mind; first, to design and fresh and reactive front end to show this the data. Next, to collect multiple data sets from various stations off the globe and lastly, display the data in an intuitive model keeping the end user in mind.

II. PROBLEM DEFINITION

[IV]Current state of the art weather monitoring websites provides us with the data which is used for all our daily updates and forecasting needs. This data can be provided by independent services, government owned stations or corporate entities via a subscription plan or a onetime purchase. With all these facilities, we run into the problem of tacky, uninteresting and hard to navigate websites fronts which are used to display the data gathered. These sites often suffer from slow loading speeds and lack a cross device compatibility created due to poor design. They often also contain mistakes like poor tiny text hyperlinks, an inappropriate used of pagination, unnecessary and long registration pages and old permalinks to name a few.

Due to these issues, an end-user is often discouraged from using the site as it denies them the basic weather updates at the tip of their fingertips and often loses any visitors it has in the often tedious and jarring registration popups and ad notifications. Thus, our plan includes in designing and implementing a better, faster and more responsive weather monitoring website which will introduce a better alternative to the existing options. To do we plan to use weather data from independent weather stations through an API, POST that data on out HTML webpage which will be styled using CSS and Vanilla JavaScript.

III. MOTIVATION

Any good weather monitoring system is only as good as the service it uses to display the data it gathers i.e. without a reliable and accessible platform; users can't tap into the immense data gather from monitoring systems. We thus, made it our main motivation and mission to reduce the distance between a robust weather website and the current sloppy pages available on the web. We as a team also believe to better ourselves through learning new skills and conquering all challenges head-on however daunting they may seem. Also, we looked as the chaotic situation created by the fear of the pandemic, as an opportunity to dedicate our efforts and time into a project which can help any and all looking for a solution to all their weather needs.

IV. LITERATURE SURVEY

For our literature survey we referred to the papers by Simon Holm Jensen, Magnus Madsen and Anders Møller titled 'Modeling the HTML DOM and browser API in static analysis of JavaScript web applications' and the book 'Single Web Application: JavaScript end-to-end' by Michael Mikowski and Josh Powell. We also refer to the resource book titled 'Dynamic HTML: The Definitive Reference: A Comprehensive Resource for HTML, CSS, DOM & JavaScript' by Danny Goodman.

[I] In their paper Modeling the HTML DOM and browser API in static analysis of JavaScript Web Applications, authors Simon, Magnus and Anders discussed the challenges, which include the dynamic aspects of JavaScript and the complex interactions between JavaScript, HTML, and the browser. From this, we understood the flow of control and data in modern JavaScript applications that interact with the HTML DOM and browser API.
[II] Through the book on Single Web Applications by Michael Mikowski and Josh Powell we learnt to build modern browser-based apps that take advantage of stronger client platforms and more predictable bandwidth. We learnt the SPA design approach, and then started exploring new techniques like structured JavaScript and responsive design. This allowed us to push our website to provide a smooth user experience, much like a native application, communicating with the server only to synchronize data.
[III] Lastly, the book 'Dynamic HTML: The Definitive Reference' provided at-a-glance references for the tags, attributes, objects, properties, methods, and events of HTML, XHTML, CSS, DOM, and core JavaScript.

V. PROPOSED DESIGN

We first brainstormed on our project to decide the number of elements and their layouts on our slides following which we drew up wireframes to get a better idea of our elements and their positions with respect to each other.

Figure 1: Home page with current weather and 5-day forecast (Wireframe)

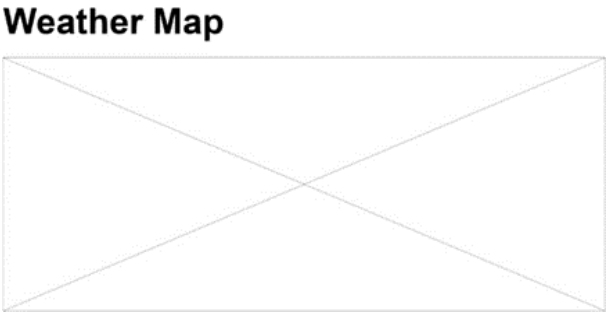


Figure 2: Map page with map box and layers (Wireframe)

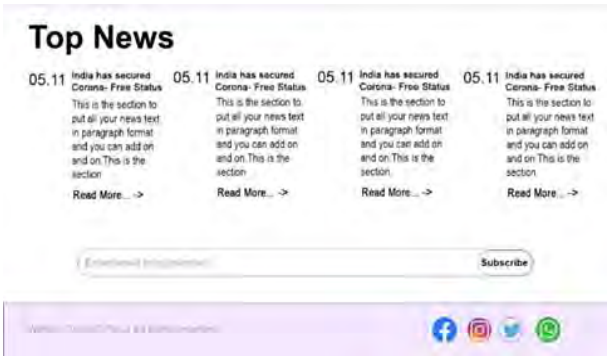


Figure 3: News section with current headline and subscription and social handles (Wireframe)

After an initial brainstorming session, we had successfully conceptualized a wireframe layout of our website which we could build on further. The next agenda on the table was deciding the technologies we would use for to achieve the results required for our project. It was clear that we first needed to find reliable APIs (Application Programming Interface) to gather our live data from. An API defines interactions between multiple software intermediaries. It defines the kinds of calls or requests that can be made, how to make them, the data formats that should be used, the conventions to follow, etc. In this case, we used (https://openweathermap.org/) for our map and parameters and (https://newsapi.org/) for the headlines. To build the structure of the website, we turned to HTML5. HTML5 is a markup language used for structuring and presenting content on the World Wide Web. It is the fifth and latest major HTML version that is a World Wide Web Consortium recommendation. The current specification is known as the HTML Living Standard. This allows it to be well supported for seamless cross-platform interface.
For our website logic and animations, we decided on using JavaScript with jQuery and JSON to handle the data manipulation of web elements.
Finally, we paired our code with MySQL to create a database for all queries and subscription emails the site gathers from the user. MySQL creates a database for storing and manipulating data, defining the relationship of each table. Clients can make requests by typing specific SQL statements on MySQL. The server application will respond with the requested information and it will appear on the clients' side.

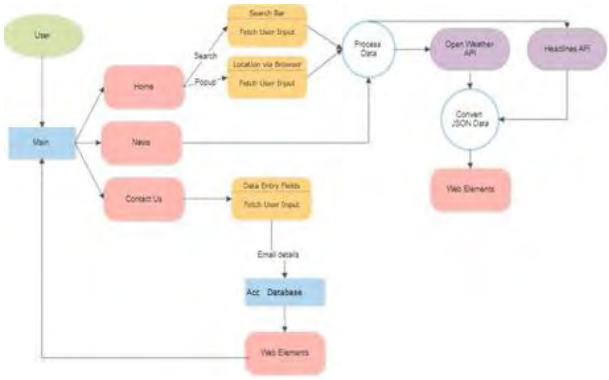


Figure 4: Data Flow Diagram showing user traverse the website

VI. RESULT & DISCUSSIONS

Using the technologies at our disposal we were able to execute our program and get the desired results. The user on visiting the site is first greeted with the Home page with the option to either grant location access to the page in which case the website will display the site information using the current location of the device (via browser geo location Tag). In case the user denies the site location access, the site can then find the weather based on the user input in the search bar.

Figure 5: Home page with parameters. Browser Prompt for location access

Next, we established a map box which gives the user access to various weather map layers {wind speed, temperature gradient, pressure gradient (w.r.t. sea level), weather alerts.}

Figure 6: Map page with various layers. User can choose to change between layers using buttons

Next, we build a news column section where in users can get the day's headlines either of the current location or of the location they chose. You can choose to read more in which case you will be directed to the page of the related news site.

Figure 7: News column with day's headlines. All headlines are from local news source of region

Finally, we built a contact us page where user can add their information and queries or suggestions, and the administrator can that the stores in the database for future references.

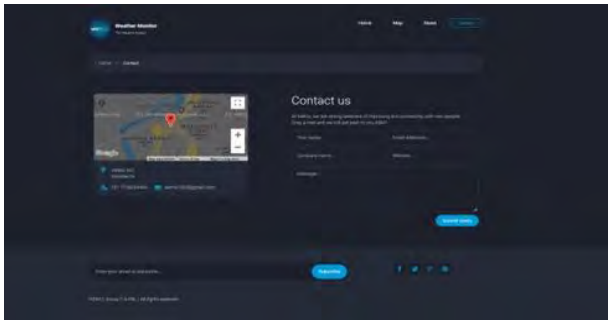


Figure 8: Contact Us page to allow for users to drop in queries

VIII. CONCLUSION

To summarize, we successfully designed and implemented a weather monitoring website and enriched it with new interactive features for the user. Our website will have mass applications in daily users And weather enthusiastic alike, scientific studies and experimentation which need accurate weather information and even in the agricultural sector where farmers and crop land owners and easily get the weather update of their region.

Through this project we gained numerous learning experiences. First and foremost, we learnt new technologies and tools for developing this website. We were encouraged to find new and creative ways to tackle our problems while keeping up with the deadlines. This project helped us develop our time-management and teamwork skills while also building our confidence through weekly presentations to our mentors. Lastly, we were able to lay the foundation for essential skills like Web Development which will surely come handy in all our future endeavors.

As no project venture reaches its peak potential and can always be built on and improved further, we realized our projects future applications. Firstly, we can employ better weather models for data gathering an improve our info graphics to get a more intuitive user experience. Next, our site can have more user features like A suggestion features which like 'Day's Outfit', 'Mood Playlist', 'Activity To-Do-day' based on the weather and atmospheric conditions. Site can have better alert models which can give a more informative alert for local storms, hurricanes, wildfires etc. [V] lastly, 58% of web traffic worldwide came from mobile users in 2019, compared to 56.7% from desktop users. Hence upgrading our site to a mobile application will allow us to get more user traffic to our services.

IX. APPENDICES

List of equipment's: The project revolved around the designing and the development of a website using databases and APIs found online. Hence, in terms of practical equipment, we relied mostly on a code-editor, suitable OS (Operating System) to run it on and a compatible web browser to test our site on.

- Wireframe, UI/UX Building- Adobe XD
- Code editor used- Visual Studio Code (version 1.42)
- Operating System Used- Windows 10 (64-bit) - Version 1803 (build 10.0.17134) or later. (With .NET Framework 4.5.2 or higher)
- 13 inches or larger display, 1280x800 resolution.
- 4Gb RAM or higher
- Intel or AMD processor with 64-bit support
- Minimum Direct 3D DDI Feature Set: 10. (For Intel GPU, drivers released in 2014 or later are necessary.)
- Browser used- Google Chrome

REFERENCES

[1] Modeling the HTML DOM and browser API in static analysis of JavaScript web applications
ESEC/FSE '11: Proceedings of the 19th ACM SIGSOFT symposium and the 13th European conference on Foundations of software engineering Pages 59-69
September 2011 https://doi.org/10.1145/2025113.2025125
[2] Single page web applications: JavaScript end-to-end
Manning Publications Co.,3 Lewis Street Greenwich, CT. United States, 2013 ISBN:978-1-61729-075-6
[3] Dynamic HTML: The Definitive Reference O'Reilly Media, Inc., 2007 ISBN:0596527403, 9780596527402
[4] Weather Monitoring Market Research
https://bit.ly/3pAFBCB (2020)
[5] Net Browsing Statistics (Devices)
https://bit.ly/385rtKR (2020)

Design and Develop A Database On Household Appliances and Suggest Methods to Recycle Them

Ishan Gosain
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
ishangosain98@gmail.com

Yash Dubey
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
yashdubey413@gmail.com

Kamlesh Jadhav.
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
yashj7572@gmail.com

Purnima Chandrasekar
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai,India
purnima.chandrasekar@thakuredt hakure.org

***Abstract*— Nowadays it Is difficult for people to research and collect information about how to recycle household appliances due to time constraints and other issues. We have designed a website for providing methods to recycle household appliances. Therefore, we have developed a website where we have provided easy and time efficient methods of recycling household appliances. Also, for convenience YouTube videos and other detailed information is provided. On the database there are many household appliances in the list. According to the user convenience there are many recycling methods for every household appliance which are provided in the list. Also, the user can find unique and comfortable methods with our website.**

Keywords—Internet of Things (IOT), IIOT, DHT11, Dust Sensor, Monitoring and Controlling

I INTRODUCTION

Now the time is of use and throw objects and appliances. But to save our environment recycling is must, hence to provide easy, time efficient and effective recycling techniques we have developed a database to recycle household appliances.

Recycling of household appliances with easy and time efficient methods. We have created a Website containing a list of various household appliances. Once an appliance is selected information regarding the appliance and a method for recycling that appliance is provided step by step. Also a YouTube player is added

For more convenience and a few reference links are provided if necessary.

To solve this problem and to create awareness and provide easy and feasible techniques we have developed a website. Our goal is to contribute in making our plane more sustainable.

II LITERATURE SURVEY

In literature survey we found that 90% people just throw the old household appliances and get new ones. Also there is not much awareness about various methods of up cycling damaged appliances.

In recent years, people have paid more and more attentions to recycling of waste Household appliances reasonably, which has become a new field of development in reverse logistics as India enters the peak of obsolescence. There are great differences between recycling waste household appliances and sales in forward logistics. Generally, quantity and quality of recycling, recovery time and other factors are not known previously so enterprises find it difficult to recycle the waste Household appliances it increases information transparency that the customers communicate with recycling enterprises, and reduce the characteristics of uncertain in the process of recycling. There is no doubt it provides a foundation for the study of recycling system. The dumping of e-waste, particularly computer waste, into India from developed countries has further complicated the problems with the management of E- Waste, .The increased ‘market penetration’ into the developing countries and ‘high obsolescence rate’ make e-waste one of the fastest growing waste streams all over the world. Thus e- waste management has become not only an issue of environment but also human health. It also possesses a series challenge in disposal and recycling to both developed and developing countries

III. PROPOSED DESIGN

We have created a Website containing a list of various household appliances. Once an appliance is selected information regarding the appliance and a method for recycling that appliance is provided step by step. Also a YouTube player is added for more convenience and a few reference links are provided if necessary our website consists of a front end and a backend. The front end consists of a homepage which has information about our website and uses and importance of recycling damaged appliances. There is also an about us page and a contacts page. The backend consists of a database which stores information about various users who

would post their queries or suggestions regarding our website consists of a front end and a backend. The front end consists of a homepage which has information about our website and uses and importance of recycling damaged appliances. There is also an about us page and a contacts page. The backend consists of a database which stores information about various users who would post their queries or suggestions regarding our website: The homepage of the website consists of various options such as Select Appliance, Contact Us, About Us and Feedback. Once select appliance is selected the user the user is redirected to a list of appliance from which when an appliance is selected it provides detailed step by step information on how to recycle the selected appliance along with a YouTube video explaining the same. When the feedback button is clicked the user is redirected to form where the user has to enter their email, phone number and comment.
This data gets stored in the database.

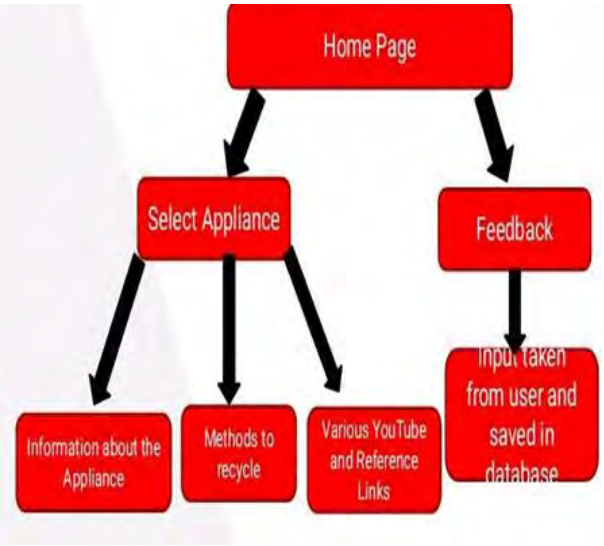


Figure 1. Data flow diagram

IV RESULT & DISCUSSIONS

Through this project we gained practical experience in the field of developing a website. We learnt how to optimize a website and make it user friendly. We also learnt how to develop content for a website. This project also helped us to dive deeper into the subject of Recycling and up cycling damaged or unused products and appliances.

This is the homepage of the website which contains various options such as Select Appliance, Contact Us , About Us and Feedback. Once the select appliance button is selected the below page appears. The Contact Us Buttons gives information about the developers whereas the gallery option has a list of pictures related to recycling of household appliances

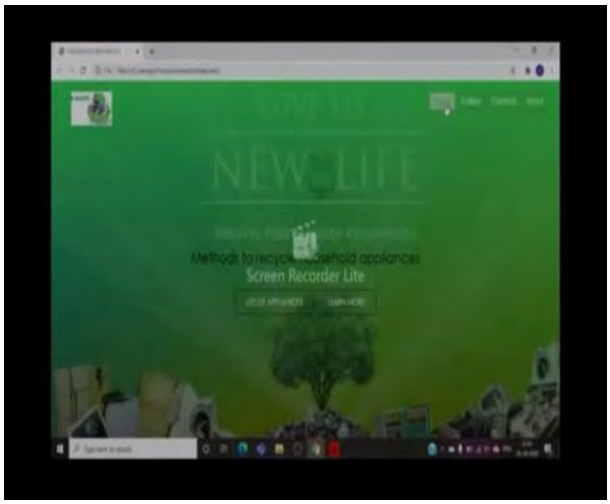


Fig 2: Homepage

Fig 3: List of Appliances

Fig 4: Information Page

Once the appliance is selected this page appears where information regarding how to recycle the appliance is provided along with a YouTube video explaining the same.

Fig 5: Feedback Page

When the feedback button is clicked the user is redirected to form where the user has to enter their email, phone number and comment. This data gets stored in the database

V CONCLUSION

Today the world is facing problems like land pollution, overabundance ofE-Waste, lack of awareness among people regarding proper methods of recycling, etc. So in order to help creating awareness regarding recycling options and providing people with new and innovative ideas for recycling their damaged household appliances we tried to develop a website which caters for the aforementioned purposes. Our project website consists of a front end and a backend.

The front end has been used to display the content of the website. It has various options such as Select Appliance, Contact Us, About Us, Feedback, Home and Gallery. The select appliance button once clicked provides a list of appliances from which an appliance can be selected and then information about how to recycle that appliance along with a YouTube video about the same will be displayed. The backend of the website is used for collecting and storing feedback collected from the user. Through this project we learnt about website and database creation. We learnt how to optimize a website according to the user's convenience. The importance of proper waste disposal was understood. Various methods of recycling appliances and products were learnt. The functioning of various applications which are used for the creation of a website were understood.

VI FUTURE SCOPE

In the future more appliances and methods can be added to the database with the help of the website a network between the recycling factories and people looking to get their appliances recycled can be established. This in turn will create a network between the people looking to get their appliances recycled and the organizations recycling the appliances.

VII REFERENCES

[1] The study of recycling system of household appliances - by Jin Wei,
Available (Online):
https://www.researchgate.net/publication/329785568_
The_Study_of_Recycling_System_of_Waste_Household_Appliances_Based_on_Network_Information_Platf orm

[2] Management and recycling of electronic waste - by piaTanskanen ,Available (Online):
https://www.researchgate.net/publication/257541214_
Management_and_Recycling_of_Electronic_Waste

This page is kept blank intentionally

Design and Development of Website on Tourism

Subodh Yadav
Department of Electronics and Telecommunication Engineering, Thakur College of Engineering and Technology,
Mumbai, India
subodh16728@gmail.com

Sumiran Singh
Department of Electronics and Telecommunication Engineering, Thakur College of Engineering and Technology,
Mumbai, India
sumi14mar2001@gmail.com

Shlok Sharma
Department of Electronics and Telecommunication Engineering, Thakur College of Engineering and Technology
Mumbai, India
sharmashlok1977@gmail.com

Deepak S. Shete
Department of Electronics and Telecommunication Engineering,Thakur College of Engineering and Technology,
Mumbai, India
deepak.shete@thakureducation.org

Abstract — **Tourism industry events are getting more and more importance due to its growth in the country. People have become more involved in events of all kinds, and hence will visit far away to take their participation in events that they find more interesting. This project is going to have some basic facilities with some enhanced one including trip images & their information's. The goal of this project was to design and develop a website for tourism to provide the basic information of the places out there, naming "Travels And Tourism". Where the users can come and see their places of visit and make the decision to visit whatever the places they want. If the users are facing any kind of issues or having any queries/suggestions then also they can contact us by dropping a mail to us or by direct calling us. The Project was implemented as an information providing website which was particularly made with the help of HTML (Hyper Text Markup Language) used for creating the web pages, CSS (Cascading Style Sheets) used for the designing/styling of the website & Java Script to make the pages dynamic**.

Keywords — Travels and tourism, HTML, CSS, Java Script, Dynamic pages.

I. INTRODUCTION

With the help of the tourism website, it will be more convenient for the visitor to find the best places to visit. User will get the complete details of the place they want to visit and the hotel and other information will be also provided to them. Visitors can now have the pre-look of the place they want to visit. Due to E-tourism, now user can get accurate information's in just few minutes. In the early stages, the E-tourism was not possible and was also not popular and because of that people used to spend their most of the time in finding the best places to visit and many more information's like that. So, Travels and Tourism came up with an idea of resolving these people's issues and providing them best knowledge about the travels and tourism in a very short span of time. People will be able to explore through the travels and tourism website and will be able to get the desired information in a very short span of time.

II. PROBLEM DEFINITION

Before the digital age, there were no tourism websites, therefore people used make the bookings and arrange all the things that are necessary in a vacation on their own. Travelers weren't aware of the things regarding travelling and staying at different places, they couldn't compare accommodation costs and the services offered by individual providers, like price range of different hotels, most affordable flight/train/cabs, cheapest travel packages etc. beautiful tourist locations of a city or state Earlier, pre-visit was also not possible, due to which people couldn't see what they are paying for until they visit there personally. Also, visitors had limited options of the places to visit, when E-tourism didn't exist.

III. MOTIVATION

Currently there are many existing websites which are not providing the proper information to the users and just to decrease their bounce rate, they are making users active on their websites. Also, these sites are making bad use of the cookies and sharing the user's information with the other sites in order to make the profit. These sites also have the less security & because of that user's data can be lost. Due to the low speed of the websites these websites are not able to become interactive and user friendly with the users and they (users) search for some other sites from where they can get the required information's whatever they want. So these things also create a bad impression on users and the user and the website manager both suffer heavy loss due to these much issues. Looking towards these issues we decided to design and develop a website based on tourism which is going to resolve many of the above-mentioned issues.

IV. LITERATURE SURVEY

Rob Law & Billy Bai in their paper title "Website development and Evaluations in Tourism: A Retrospective Analysis" commented that the current business enterprises heavily accept e-commerce to gain various business goals, and due to this reason, the

method of maintaining a good quality and effective website is essential for a business to strengthen its customer base & relationships and to master in business transactions. In the view of travels and tourism, the information intensive and customer-oriented nature of the industry seems to be particularly accessible for the adoption of e-commerce. Various studies have been reportedly made the statement about tourism enterprises utilizing the Internet for search information's, transactions of the business, and building of the relationships.

In "Tourism development in the urban side's promenades (Study case: Barzok City)" by Leila Gorji, Nooshin Mosavian & Razieh Dehghani they commented that the process of Tourism is rooted in Motion and displacement and it provides mobility to the life of human in impartibly way. These days tourism activity is one of the most dynamic activities all over the world, so that the total number of domestic and foreign tourists and its revenue should be growing continuously in the world. Many countries are increasingly aware of the fact that for enhancing their economic situation all they require is to initiate and seek new ways to cope up with that. One of these methods is e-tourism that have much importance and have attracted attention of the various of the countries over the past few decades. Ecotourism, in the countryside is the most interest for those who stay in urban areas with good financial status but have stressful life and want themselves to return back to nature and live-in rural communities.

Devashish Dasgupta & Dr. Utkarsh in their paper titled "Assessing Tourism Website Effectiveness of Top ten Tourist attracting nations" told that Website evaluation has been studied extensively in Information Systems and Tourism literature; but some studies combine information system issues with the Tourists decision making perspective. In this particular research they evaluated websites based on a comprehensive set of criteria, based on the five factors of website effectiveness. One of the Content analysis of an official tourism websites of the top ten ranking tourists attracting countries was done and the data was recorded based on the Correspondence analysis and weighted mean scores. Findings shows that the websites need to improve themselves on certain factors, the two most important being Security and the Responsiveness.

V. Proposed Design

The design basically includes the Homepage having the title as "Travels and Tourism" and is basically divided into several parts like the homepage then the navigation bar is there consisting of Blogs, Places, Services and About us part. Each part has several meaning and various pages that are being associated with it. The above mentioned parts and topics are basically created with the help of HTML (Hyper Text Markup Language) i.e. for creating those web pages HTML is being used and with the help of CSS (Cascading Style Sheets) all the web pages are being designed very beautifully so that it looks more attractive when user visits there and to make the website more interactive the Java Script language is used.

The blogs section is the part where the customers who had already visited share their experience with us and by filtering among all we share the best content to the users. There are a total of 12 places and their images on the website along with the information of the several places like Golden temple and all.

Places basically include North, Central, Northeastern & South part of the country. The next part is the services we provide to our users like making their Visa ready for the travelling and other purpose, doing their bookings on time and giving Personalized Travel plans to our customers. The about us part is having the details of the Tour and Travels website. It also includes some of the various features of our services and the users can explore more about our Website through this section.

Figure 1. Data flow diagram

VI. Result and Discussion

The homepage of the website is having the title as "Travels and Tourism" where a navigation bar is created with four different options as Blogs, Places, Services & About us part. The blogs section where the customers who had already visited share their experience with us and by filtering among all we share the best content to the users. There are a total of 12 places and their images on the website along with the information of the several places like Golden temple and all. Places basically include North, Central, Northeastern & South part of the country. Then there is a brief information's of all the services we provide to our users like making their Visa ready for the travelling and other purpose, doing their bookings on time and giving Personalized Travel plans to our customers.

SCOPE OF PROJECT

People will love to visit tourism places in future also, as nothing can replace the feel of nature. In future, it will be easier to connect people on tourism sites with the help of advanced technology. Competition will be more & therefore people will experience amazing user

interface & contents. Looking towards the upcoming technological world, one can say that E-tourism will be a longer part of that world as nature is not going to destroy that early. Also the website is made using HTML[2], CSS[3] and Java Script[4], so it can be said that in future also these languages will last longer and by using these languages it will be easier for a developer to make these kind of websites as they are already existed.

VII. CONCLUSION

The front end of the dynamic web application has been successfully completed under Project Based Learning (PBL) – Semester III. The website was successfully created for Travels and Tourism that is used to provide information of the several places. It was created using HTML (Hyper Text Markup Language) used for creating the web pages, CSS (Cascading Style Sheets) used for the designing/styling of the website & Java Script to make the pages dynamic. The design has been developed in such a manner that it is minimal and efficient, hence taking care of UI/UX. With help of JavaScript a powerful view has been developed and site has been made more dynamic.

REFERENCES

[1] "2019 ANNUAL RESEARCH: KEY HIGHLIGHTS" (PDF). WTTC. Archived from the original (PDF) on 30 December 2019. Retrieved 15 March 2019.

[2] "HTML 4.0 Specification — W3C Recommendation — Conformance: requirements and recommendations". W3. World Wide Web Consortium. December 18, 1997. Archived from the original on July 5, 2015. Retrieved July 6, 2015.

[3] "CSS developer guide". Mozilla Developer Network. Archived from the original on 2015-09-25. Retrieved 2015-09-24.

[4] JavaScript". Collins English Dictionary – Complete & Unabridged 2012 Digital Edition. William Collins Sons & Co. 2012. Retrieved 21 August 2015.

This page is kept blank intentionally

Abhigyata - Lets Change the Way We Perceive Mental Health

Vedant Panchal
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, India
panchalvedant13@gmail.com

Ananya Srivastava
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, India
ananya16cl@gmail

Aniket Yadav
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, India
aniyad304@gmail

***Abstract* - A mental disorder, also called a mental illness or psychiatric disorder, is a behavioural or mental pattern that causes significant distress or impairment of personal functioning. Such features may be persistent, relapsing and remitting, or occur as a single episode. Many disorders have been described, with signs and symptoms that vary widely between specific disorders. With the progress in technology, information from all around the world on all possible subjects is available on our devices. The World Wide Web has now become an adequate platform to inform individuals about various social topics and to create awareness. hus the web becomes an adequate platform to increase awareness about a social topic like mental health.**

Key words- mental health, awareness, mental health disorders, therapy

I. INTRODUCTION

A mental disorder, also called a mental disease or psychiatric disorder, is be a behavioural or mental pattern that causes significant distress or impairment of private functioning. Such features could also be persistent, relapsing and remitting, or occur as one episode. Many disorders are described, with signs and symptoms that change widely between specific disorders. Mental disorders may be a psychological state problem that affects a person's thinking and behaviour. Everyone is vulnerable to mental diseases. While genetic factors do play a task within the onset but it's not always the case. There are families with a history of mental illnesses, and other relations show no signs of it. On the opposite hand, there are families with no predisposition to mental illnesses, and it suddenly strikes any loved one . Within the present era, modern technology has paved the way for multifunctional devices like smart phones and smart watches. There are around 4.3 million smart phone users in India. And with 2.5 million apps – available across digital marketplaces, smart phones are impacting day-to-day life in some surprising ways. The smart use of Smartphone increases your brain's functioning helping to remain active. About 89% of the population in India say they're affected by stress compared to the worldwide average of 86. The purpose of this study is to find the awareness of mental health applications in Indian smart phone users so that it can be utilized for improving mental health. Mental health is a major concern worldwide and India is not far behind in sharing this. If we evaluate developments in the field of mental health, the pace appears to be slow.

II. LITERATURE SURVEY

Mental health burden may be a major health concern worldwide. within the previous couple of decades, we are witnessing innovations that are successfully addressing gaps within the psychological state service delivery in Indian context. this is often an opportune time to explore existing innovative psychological state initiatives within the country and integrate viable interventions to primary healthcare facilities to strengthen public mental health care delivery. psychological state awareness campaigns have yielded positive outcomes. a number of the strategies undertaken to focus on awareness and address stigma around mental disease include participation by relations, sensitization to treatment and social inclusion. Lack of data about the mental illnesses poses a challenge to the psychological treatment. Research has highlighted the role of community-based systems in low-income countries and has also yielded positive leads to creating awareness, thereby impacting participation. Awareness and health literacy are two sides of the same coin. Stigma and discrimination are negative consequences of ignorance and misinformation. There are a couple of studies which have measured psychological state literacy within the Indian context. One study found psychological state literacy among adolescents to be very low, i.e. depression was identified by 29.04% and schizophrenia/psychosis was recognized only by 1.31%. Stigma was noted to be present in help-seeking. These findings reinforce the necessity to extend awareness of psychological state . psychological state literacy may be a related concept which is increasingly seen as a crucial measure of the notice and knowledge of psychological state disorders.

III. PROPOSED SYSTEM

The proposed methodology for the project is to create a front end website to create awareness about mental health. The website will feature 3 topics- the situation of mental health awareness in India, symptoms of certain behavioral disorders and organizations that can help an

individual seeking counselling. The website was created with the help of HTML and CSS.

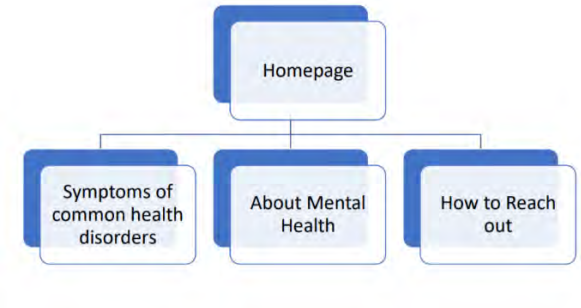


Fig. 1: Flowchart of Website

The above figure depicts the Flow of the Website. The first page of this website consists of the Home Page which holds the title of the project:- Abhigyata:– Lets change the way we perceive Mental Health. Below this title there we have inserted three button options viz. Symptoms of common health disorders, About Mental Health and How to Reach out different organizations who help the patients to curb this illness as soon as possible.

IV. RESULT AND DISCUSSION

The website is Created with the intention of increasing the awareness of our mental health. From a technical perspective, the concepts and terminology of HTML and CSS were applied, hence increasing proficiency in these two languages. After creating this website, there will be a common platform on which the people can surf regarding mental state. This website has also brought more recognition on mental health and what we as individuals can do to keep our mental health in proper shape.

Fig 2: Homepage of Website

This is the homepage which acts as an introduction to the project. The prominent feature of this page is the navigation bar which leads us to the three subpages.

Fig 3: Web page on Mental Health Awareness In India
This page gives the information about the state of Mental Health in the Country of India and the steps being taken to bring awareness to mental health.

Fig 4: Web page on commonly diagnosed Mental Health Disorders

This page gives us information about commonly diagnosed mental health disorders and their symptoms.

Fig 5: Web page on organizations working on Mental Health Awareness

This page gives the viewer information about certain organizations working for mental health awareness.

The website aims to increase awareness and clear misconceptions about mental illnesses. Using a medium that is accessed by millions of people, the website acts as a medium to educate the viewers about mental health disorders and methods to help themselves or their loved ones receive appropriate treatment.

V. CONCLUSION

Almost half of the young generation across the globe are experiencing mental health problems. Most of them are experiencing different forms of depression and anxiety caused by peer pressure, family concerns, and poor self-esteem. Also, those who are experiencing these resort to a lot of dangerous activities that could lead to serious complications. However individuals are not considering mental health a priority.

We have come up with an idea to make an awareness amongst the people not to neglect their mental health in any circumstances since it matters the most in recent lifestyle. Hence, we have come up with the solution to create such website which increases the awareness regarding our Mental health, its importance and symptoms to go through to check whether you are affected by this silent deadly killer. Although mental health is a fundamental component of health, recognition of mental disorders and awareness about its importance is limited. Stigma and lack of understanding about mental disorders are major barriers to seeking help and promoting better mental health. Increasing understanding and overcoming stigma through strategic communications and social mobilization are crucial steps towards strengthening mental health programmes.

REFERENCES

[1] India code, 'Definition of Mental Healthcare Act, 2017', [Online]. Available: https://www.indiacode.nic.in/showdata?actid=AC_CEN_12_13_00024_201710_1517807327874&sectionId=6208&sectionno=2&orderno=2

[2]National Institute Of Mental Health, 'Health Topics', [Online]. Available: https://www.nimh.nih.gov/health/topics/index.shtml

[3] Child Mind Institute, 'Introduction', [Online]. Available: www.Childmind.org

[4] Manav Foundation, 'Genesis' [Online]. Available: www.manavfoundation.org.in

[5] Psych Central.com, Symptoms And 'Treatments of Mental Health Disorders', [Online]. Available: https://psychcentral.com/disorders/disorder

This page is kept blank intentionally

A Convertible Smart Wheelchair for Disabled Persons

Mrs. Poorva Waingankar
Ass. Professor Department of Electronics
Thakur College of Engineering and Technology
Mumbai, India
pwaingankar@gmail.com

Dishant Doshi
Department of Electronics
Thakur College of Engineering and Technology
Mumbai, India
dishantdoshi65@gmail.com

Kshithij Shetty
Department of Electronics
Thakur College of Engineering and Technology
Mumbai, India
kshithijshetty54@gmail.com

Jay Mehta
Department of Electronics
Thakur College of Engineering and Technology
Mumbai, India
28jaymehta@gmail.com

***Abstract*—This paper deals with a variety of features that are integrated into the advanced variant of the wheelchair. The advanced version of the wheelchair is electrically directed and controlled by the use of a joystick or an electronic monitor for smoother movement of the chair. As noted, it can also be difficult for the caretaker to switch the patients from the wheelchair to the stretcher or medical bed. There is a wheelchair movement presently that is regulated by the needs and wants of a person. The "Convertible Smart Wheelchair for Patients" helps the patient with disabilities to be mobile. The highlight of this design is to transform the wheelchair into a reclining bed and also to minimize the effort of the caretaker. It would provide a more efficient transfer of patients to hospitals, depending on the need. The goal is to create a lightweight, low maintenance cost, and robust wheelchair. The smart features of this model are ultrasonic sensors, diabetic sensors, body pulse rate sensors, blood pressure sensors, and biometric sensors to start the car. A Thermo gun, a lipid sensor, and a vitamin level sensor. This would make it easier for patients to have access to medical assistance and to communicate with medical professionals as well.**

Keywords—Smart Wheelchair, Disabled person, Sensors etc.

INTRODUCTION

Owing to injuries or accidents, many families are impacted by temporary or permanent disabilities. The use of a 'con-wheel' A Convertible Smart Wheelchair for Disabled Persons is becoming necessary for such adverse or impossible instances. For many of the low and medium-level disability cases, manual or electric chairs are satisfying, where patients can use the wheelchair according to their needs. In severe situations, however, it is difficult or not possible to use the wheelchairs separately, since they lack independent mobility and have to rely on someone else to operate the wheelchair. The ordinary wheelchair ranges from approximately 8k to 44k. Whereas scientific and technical advancement is abundant. In certain fields, the medical specialty area is lacking as an example for individuals who are physically disabled or because of some disabilities or illness. With the aid of the user's command, the Smart Wheel Chair is an automatically operated system. This decreases the human effort and power of the consumer to push the chair's wheels. What's more, it also offers an opportunity for people with visual or physical disabilities to switch from one location to another. Also, the wheelchair is fitted with an obstacle warning device that eliminates the risk of a crash during the ride. As it has in recent times gained heaps of attention. The devices can also be used in old-age homes wherever the movement of older people is difficult. The con-wheels are to turn a wheelchair into a reclining bed and reduce the caretaker's effort as well. Depending on the need, it will include a safer movement of patients to hospitals as well as to locations. The goal is to build a wheelchair that is light in weight, low maintenance costs, and robust. The Con-wheel is not only an ordinary wheelchair but a wheelchair with advanced technology. This device is constructed with the assistance of electronic components that control the wheelchair's actual movement rather than an ordinary wheelchair that needs powerful labor to operate. Not only is the Con-wheel an ordinary wheelchair, but a wheelchair with sophisticated technology. This system is designed with the help of electronic components that control the actual movement of the wheelchair rather than an ordinary wheelchair that requires powerful work to operate. The smart features of this device are Ultrasonic Sensors, Diabetic Sensor, Body Pulse Rate Sensor, Blood Pressure Sensor, Biometric Vehicle Start Sensor, Thermo Rifle, Lipid Sensor, and Vitamin Level Sensor.

Fig 1 Ordinary wheel chair

Fig 2: Modified Wheelchair (Smart Wheelchair)

Table 1: Comparative analysis of the cost of the wheelchair

Sr. No.	Ordinary Wheelchair	Modified Wheelchair	Future Modification
1	8k – 44k	50k – 75k	85k – 1.5lakhs

The above table shows the cost of the Wheelchair varying from ordinary wheelchair to future wheelchair. These are the estimated cost.

THEORETICAL FRAMEWORK

Electrically operated and self-controlled, the smart wheelchair can be quickly transformed to a reclining bed, the smart wheelchair has an additional benefit. The smart wheelchair removes the dilemma that an ordinary wheelchair faces. By using the biometric sensor or by entering the default pin on the keypad, the wheelchair starts. The wheelchair movement can be controlled in two ways, one by the use of a joystick on the left side of the wheelchair, and the other by the use of a keypad on the right side of the wheelchair. To prevent a collision, the ultrasonic sensor is attached to the front of the chair. To drive the wheelchair, the hub motors and the wheels are used.

Table of Hardware Components with Specification, Quantity & Cost (rs) Approx.

Sr. No	Name of Component	Specification	Quantity	Cost (rs) Approx.
1	Hub Motor	6V 250W 400RPM	2	28000
2	AVR Controller	ATmega32 – 8 Bit AVR Microcontroller	2	2000
3	Lithium Battery	Input - 100-240V 50/60HZ	2	4000
4	Rotor	0.002 inch (0.050mm)	1	1000
5	Electric brakes	12x2" CRUISEMASTER™ 5 HOLES 98.5 PCD UNEQUAL AS PICTURED 3/8" UNF x 3/4" GRADE 5 Z/P 3/8" CONELOCK GRADE C Z/P 33 N.m	1	40000
6	Diabetic Sensor	As per availability	1	
7	Blood pressure sensor	As per availability	1	500-1000
8	Biometric sensor	As per availability	1	1500
9	Pulse checker	As per availability	1	500
10	Oximeter sensor	As per availability	1	1000
11	Heart rate	As per availability	1	2000
12	ECG module	As per availability	1	500
13	Display	As per availability	1	1000

Fig 3: Hardware Component

The external battery is connected while the wheelchair is moving, which in turn lets the motors travel from one location to another, and we can plug it into the DC supply at the moment of rest, which will perform all the wheelchair's necessary functions. The patient will be tested via routine check-ups, and the same will be transmitted using the GSM module to their respective guardians/doctors.

CIRCUIT IMPLEMNTATION

The diagram design plays a critical role since the structure as a whole showing the components of the scheme is visually represented. The diagram suggested is as shown below.

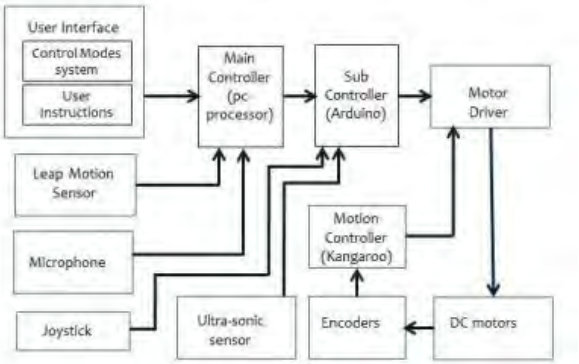


Fig 4: The block diagram of electrical and control system

The block diagram of the electrical and control system of the designed prototype of the smart wheelchair is shown in Fig.4. Initially, a person has the right to choose a control mode for a wheelchair that he wishes to control. After selecting the control mode, a function corresponding to the selected mode is executed. In the voice control mode, a microphone is used to record user-provided voice commands. Similarly, the gesture interface utilizes a leap motion sensor to record the movements of a user's palm. The sensor or microphone commands for Leap Motion are sent to the main controller and the order is evaluated (checking whether the received commands are predefined command). A laptop is used as the key controller in the assembled prototype of the intelligent wheelchair. If the received command is similar to the predefined list of commands, a command-related signal is sent to the sub-controller, which is implemented by the Arduino controller. A serial communication connection mechanism determines the communication between the main controller and the sub-controller. The Arduino sends a signal to the engine driver to shift the wheelchair. If the joystick is the chosen mode of control, another signal is sent to Arduino to execute the relevant functions of the joystick input. The joystick is attached directly to the sub controller, which is why the sub controller performs functions similar to the control mode of the joystick. Similar to the other two modes, according to the coordination offered by the joystick, the wheelchair is controlled by the motor driver. The encoders coupled with the engines are used to obtain the speed input of

the engines and are used to monitor the engines' speeds at the desired levels. This speed regulation is done by the Kangaroo motion controller by (a self-tuning feedback motion controller). The use of this feedback motion sensor reduces the overheads of the sub-computational controller, such as counting the encoders' pulses.

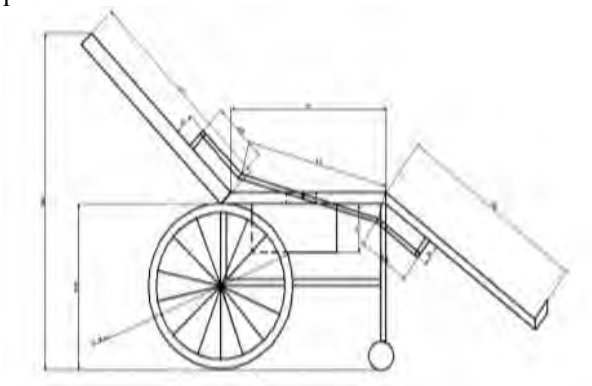


Fig5: Design model at the time of conversion

DESIGNING OF MODEL

The following models explains the design of con-wheel – A Convertible Smart Wheelchair For Disabled Person.

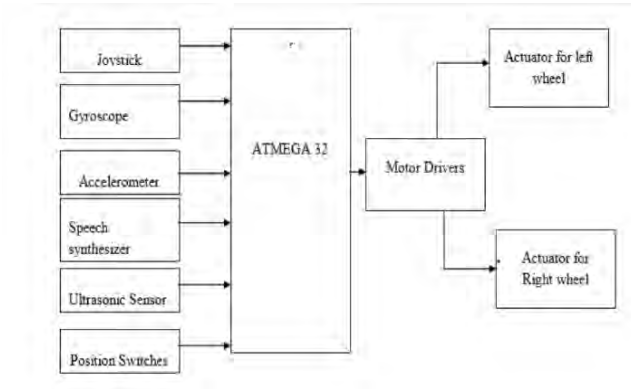


Fig 6: Block Diagram

The diagram above explains the implementation of the system's software and hardware circuit implementation by the circuit.

The Atmega 32 inputs are as follows:

Accelerometer:

To change its position, the accelerometer sensors are mounted on the wheelchair.

Synthesizer for Speech:

This module works by supplying a voice command for user input and transmitting a signal to the actuators.

Ranging Ultrasonic Module:

It is used to describe an obstruction. As a preventive measure, it is used to regulate the wheelchair's speed.

The (L3G4200D) gyroscope:

The gyroscope measures the need for input from a joystick, comparing the source of the instrument with the way the chair is trailing. If the system notices that the wheelchair is deviating from the expected route, the travel path is automatically corrected.

Uses of the Switches:

To switch the input control device to the accelerometer or the control panel, these switches are connected to the chair.

Microcontroller:

It is the primary computational and processing aspect of the Smart Wheel Chair that receives and processes input from the sensor and provides output accordingly.

Relay Switch:

An electrical device is a part of electromagnetically driven electrical equipment. The multiple relays use the related magnet to automatically control a shift mechanism. Using a low DC control voltage, it is used to start or off electrical circuits in service at high voltage.

Motor Drivers:

Motor drivers act as a connection interface between the motors and the control circuits. Whereas the controller circuit works on low current signals, a high amount of current is needed for the motor. For the output of motor drivers, therefore, a low-current control signal is required to turn it into a higher-current signal that will drive a motor.

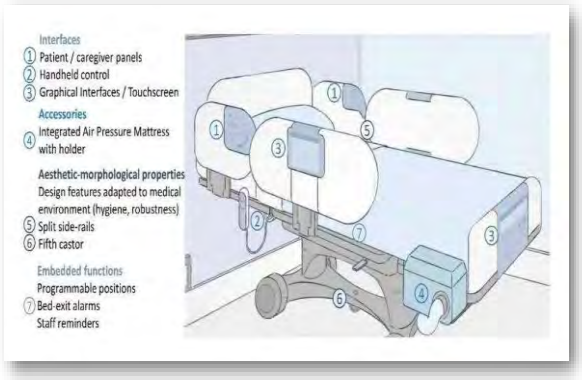


Fig7: Design model as a smart hospital bed

Figure 4.
Flowchart of navigation assistance algorithm used during reliability testing.

Fig8: Flowchart of movement of the wheelchair

FUTURE SCOPE

By increasing the battery size and automatic charging of the battery by the motion of the wheels, the potential development of the wheelchair is feasible. With the help of phones or other devices, the machine can also be run. For the motion of the wheelchair, optical sensors may also be used. Extra sensors such as heartbeat sensors can be added, line followers can also be integrated into a certain region to shift the device. To prevent direct contact, we can also enforce a no-touch policy by seeing the current scenario, i.e. COVID-19, and after it is taken to the outer setting, we will also sanitize the bed and chair.

CONCLUSION

A Con-wheel is not only an ordinary wheelchair but a wheelchair that integrates advanced features. This device is constructed with the assistance of electronic components that control the wheelchair's actual movement rather than an ordinary wheelchair that needs powerful labour to operate. As in this busy world waiting for aid to make an individual completely dependent on them, the main goal of designing this system is to help the disabled to be self-reliable and this system attempts to prevent such circumstances. The introduction of the con-wheel to the world would be a huge development in medical assistance facilities and will turn the ordinary wheelchair into a wheelchair.

REFERENCES

[1] Leaman, J., La, H. M., & Nguyen, L. (2016). Development of a smart wheelchair for people with disabilities. 2016 IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI)

[2] S. Vijayprasath,DR.Rsukanesh and S. palanival Rajan "Innovative Techniques using wireless sensors in designing smart system for disabled patints" International Journal of power control signals and computation(IJPCSC) VOL.1 NO. 4

[3] Riaz, N., & Aamir, J. B. (2014). Electrical wheel chair with retractable solar panels. 2014 International Conference on Energy Systems and Policies (ICESP). doi:10.1109/icesp.2014.7346983

[4] Vijayakumar, C., Kumar, M. P., Sivaji, S., Sadulla, S., Prathiba, J., & Kumar, K. V. (2013). Sensors based automated wheelchair. 2013 International Conference on Green Computing, Communication and Conservation of Energy (ICGCE). doi:10.1109/icgce.2013.6823476

[5] Electric powered wheelchairs. (2005). *IEEE Control Systems, 25(2), 22–34*. doi:10.1109/mcs.2005.1411382

[6] Basmajian, A., Blanco, E. E., & Asada, H. H. (n.d.). The marionette bed: automated rolling and repositioning of bedridden patients. Proceedings 2002 IEEE International Conference on Robotics and Automation (Cat. No.02CH37292).

Career Guidance Website for Undergraduate Students

Rishav Biswas
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
bissu.biswas13@gmail.com

Yash Amin
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
yashamin26@gmail.com

Advait Chirmule
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
chirmuleadvait@gmail.com

***Abstract*— In today's world, with the vast expansion of the fields in every stream, it has gotten very difficult for a person to gather information at one place so through this project, anyone can easily access the necessary information about the fields. There is also a quiz which the user can take to find a suitable engineering field.**

Keywords—career, career streams, undergraduate degree, undergraduate colleges

I. INTRODUCTION

We are creating a website that has the most sought-after streams, science, arts and commerce respectively with their individual courses which will basically cater to a vast audience and their likes and dislikes. So rather than searching countless website we have a one stop solution to all your problems with almost all the streams someone can possibly think of doing.
The website is user friendly and easy to navigate irrespective of the fact weather you are on a phone or a laptop.
In this project, we mainly used HTML, CSS Stylesheet, JavaScript and the PHP.

II. PROBLEM DEFINITION

Most children face the dilemma of choosing what stream to pursue after 12. They end up getting influenced by their parents and peer pressure and then end up regretting their decision.
Most of the students do not know whether they should follow their passion or just follow what most of the people are doing. By doing this they end up compromising on their dreams and expectations.

III. MOTIVATION

We created the project with only one thing in our mind, to make sure that no one else goes through the same hassle we did to find a suitable, we empathize with the difficulty of finding a suitable college and a course and this is our small part to the society to make sure to put all the things in one place for everyone to browse.

IV. LITERATURE SURVEY

There are a number of career options after 12th class. But the real challenge is to select the right one for you. Career guidance help students understand their strengths and weaknesses and then match them with their skills and interest so that they get the best suitable career choice.

One wrong choice can not only cost a lot of money but also amount to waste of some precious years. Professional guides use modern scientific techniques like Career Assessment Test, etc. to find out the student's strengths and weaknesses and then use these results to find a college or career.

When dealing with a lot of options, the most logical solution is the process of strategic elimination. Professional career and college counselling help in narrowing down the options so that finding the right career or college becomes easy. Professional counsellors also empower you with certain information that is not available to general people. They deduce the facts about colleges or courses out of the advertisements so that the students don't get misled.

The basic tools used to create the website were HTML, CSS and JavaScript. Codes for the following software can be written in any text editor and we VSCode as the preferred text editor.

A web page can contain headings, paragraphs, images, videos, and many other types of data. HTML elements can be used to specify what kind of information each item on a web page contains — for instance, the "p" element indicates a paragraph. HTML code is also used to specify how different items relate to one another in the overall structure of the page. Basically, HTML gives structure to the elements of a webpage.

CSS is the language for describing the presentation of Web pages, including colors, layout, and fonts. It allows one to adapt the presentation to different types of devices, such as large screens, small screens, or printers. JavaScript is an object orient programming language designed to make web development easier and more

attractive. In most cases, JavaScript is used to create responsive, interactive elements for web pages, enhancing the user experience.

V. PROPOSED DESIGN

Originally, we planned to make the site only for the Science stream because all of us creators are from that field and we already knew a lot of information about Science. But it seemed unwise to just include a part of courses while naming our project as Career Guidance for the 12th Standard students and thus we expanded the scope of our project.

We originally intended to add a career guidance quiz for all the other fields, but it was lengthy to make one and as mentioned earlier, we didn't have a lot of knowledge about the streams other than Engineering and so, we decided to stick only with Engineering to make sure that the quiz isn't inaccurate and misleading for anyone.

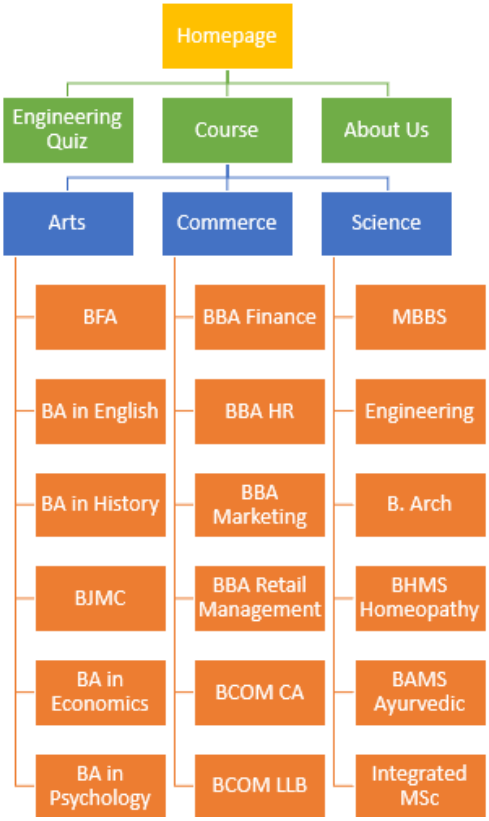


Fig.1. Data flow diagram

VI. RESULTS & DISCUSSION

In this project, we achieved what we had thought of, the different features of our website are as following:
We made a very user-friendly website which is easy to navigate and has a smooth functioning. We gathered data from all the 3 core streams i.e., Arts, Commerce and Science and the important sub-fields in these core streams. For each sub field, we provide information about the course, subjects, the top 5 colleges of the course and the official website linked to them and the job opportunities. We put together all of the data with proper linking of the web pages and made sure they can be easily found by anyone. We also made the webpage interactive by adding suitable images and a colorful background. We also put together a small quiz for the Engineering students to go through to make them decide which Engineering degree they should opt for depending on their interests. Finally, we made the web page into a professional matter adding the "About", "About the Creators", a head bar with the necessary functions etc. As shown in figure 2.

Fig.2. Home Page

The Home Page shown in figure 2, is the default page of the web application which has different navigation tools for the student to find what he/she is looking for.
As mentioned earlier, we are including the three streams, Arts, Commerce and Science in our project and this is the page from where you can click to get more information about the various fields as shown in figure 3.

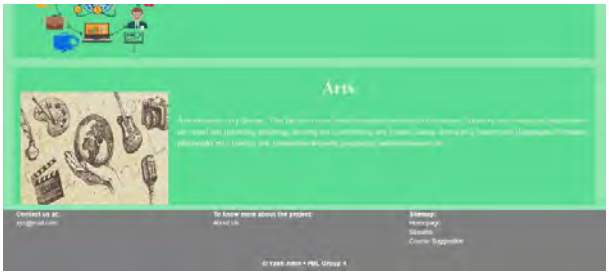


Fig.3. Course Page

All the three stream pages follow a similar format making it easy for any newcomer to navigate the pages very easily. Taking the example of the Commerce field, all the main course options are listed down, which for Commerce are bachelor's in business administration (BBA) and bachelor's in commerce (BCom) in which there are also links to the main sub-fields or the specializations in which there is further information about the same as shown in figure 4.

Fig.4. Stream Page

For the sub-field page, we provide the following information: basic information of the course, the course eligibility, the course subjects, the top 5 colleges (currently) and the job opportunities. With detailed information about everything, we also make sure to link the official pages of the top 5 colleges which we list down on the site making it super easy if anyone wants to know more about the college as shown in figure 5.

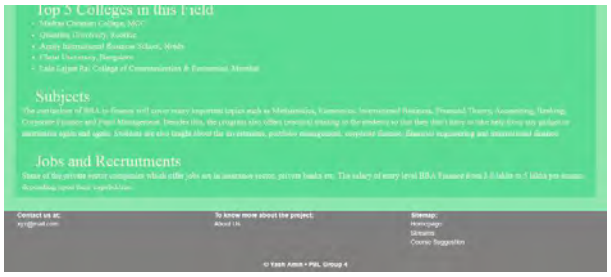


Fig.5. About page

One of the most interesting features of our website is the Aptitude Test which will help students figure out which engineering degree are they best suited to by giving a small easy quiz. The rules of the quiz are simple, for every question, you list down your interest level on the terms of 0 to 5 with 0 being least interested in the question, 5 being highly interested as shown in figure 6.

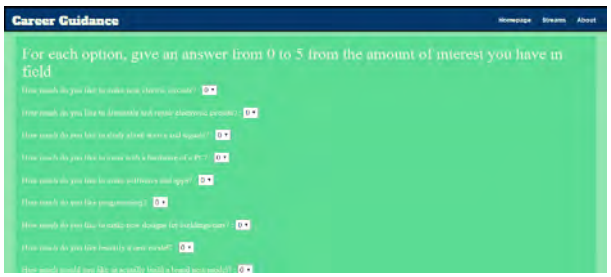


Fig.6. Quiz

VII. SCOPE OF PROJECT

It is a comprehensive, developmental program designed to assist individuals in making and implementing informed educational and occupational choices. A career guidance develops an individual's competencies in self-knowledge, educational and occupational exploration, and career planning.
Identify strengths and weaknesses. Career guidance will take you through a series of tests, for example, personality, IQ, and aptitude tests, to help evaluate your strengths and weaknesses.

VIII. CONCLUSION

In this project, we achieved what we had thought of, the different features of our website are as following:
We made a very user-friendly website which is easy to navigate and has a smooth functioning. We gathered data from all of the 3 core streams i.e., Arts, Commerce and Science and the important sub-fields in these core streams. For each sub field, we provide information about the course, subjects, the top 5 colleges of the course and the official website linked to them and the job opportunities. We put together all of the data with proper linking of the web pages and made sure they can be easily found by anyone. We also made the webpage interactive by adding suitable images and a colorful background. We also put together a small quiz for the Engineering students to go through to make them decide which Engineering degree they should opt for depending on their interests. Finally, we made the web page into a professional matter adding the “About”, “About the Creators”, a head bar with the necessary functions etc.

REFERENCES

[1] https://www.upgrad.com/blog/career-options-for-commerce-students/ .
[2] https://www.jagranjosh.com/careers/after-12th-arts-and-humanities-1530159799-1
[3] https://www.indiaeducation.net/careercenter/science/ .
[4] https://www.w3schools.com/default.asp .

This page is kept blank intentionally

Voice Control Based Multipurpose Product Sorting System

Kaustubh Rajan
Department of Electronics
Thakur College of Engineering and Technology
Mumbai, India
kaustubhrajan18@gmail.com

Aakash Mishra
Department of Electronics
Thakur College of Engineering and Technology
Mumbai, India
Mramst408@gmail.com

Prashant Jha
Department of Electronics
Thakur College of Engineering and Technology
Mumbai, India
prashantjha1031@gmail.com

***Abstract*— In many large scale and small scale field product sorting plays very important role which becomes very complex to find a particular item in the place where all different item are stored individually. So many industries and warehouses they manually check in their system that in which section the particular item is stored. The main aim is to propose an Voice operated system which makes this operation simpler like the user just has to say the particular item name and the voice recognition system will recognize the users voice and send it to the system and the location of that particular item will be displayed and also it will be indicated with led just below the section where the item is been stored also the user can remotely access this from a long distance through the mobile phone to check the stock update and also for sorting.**

Keywords—Sorting system, Voice based, Product sorting

I. INTRODUCTION

The objective is to create an environment where the work of an individual or a person is to find something, gets easier and also it can be operated from anywhere. Also, it reduces the cost of man work. The aim of this project is to reduce the number of man hours to sort or to find something just via an app in our phone. We can map any product also we don't have to type a keyword or name of product because of voice recognition module we can verbally communicate our system. The system will provide actual set of product quantities which are been saved in Realtime database, as well as product's required invoice is been generated.

As new and refined technologies continue to emerge, it is changing the preferences of the Indian consumer and evolving their mindset. This means, they are now expecting seamless shopping experiences across all channels. This means, they are now expecting seamless shopping experiences across all channels; brick-and-mortar stores or e-commerce platforms and mobile apps. Brands will have to embrace the change and prepare for these upcoming trends that will transform their industry in 2020:

Focusing on in-store experiences

Gone are the days when retail simply focused on selling products. The new-age consumers seek engaging experiences over material possessions. Retail brand stores will be combining traditional elements with tech-enabled aspects activities like in-store tabs to add layers and new experiences to their old-fashioned retail models. By developing a customer-centric approach in their businesses that can let the consumers interact with the brand and even give feedback for the same, retailers in the brick-and-mortar space can generate a better brand recall and escalated sales.

Expansion of data collection and analytics

Big Data is everywhere and online retail has already been leveraging it to identify and assess buying patterns, trends, demands etc. This year, Big Data will finally pave its way into the offline retail space to create a significant impact on its future sales. Brick-and-mortar retailers will be able to expand their collection of data through both point of sale and website cookies in order to understand the customers' expectations and optimize profits.

All the above trends have been driven by a combination of a progressive technological landscape and the shifting preferences of consumers. By embracing them and preparing for them, retailers can foresee 2020 as yet another positive opportunity to flourish.

II. LITERATURE SURVEY

The first paper we referred to was Building colour Sensor Based on Image Processing Technology for Automatic Colour Object Sorting Using PLC System. The main idea of referring to this paper was how colour sensors are used with image processing to identify colour object and how PLC system is used for product sorting with higher accuracy and also how Raspberry pi is used with camera to act as a colour sensor that transfer input signal to the PLC system and Human-Machine Interface (HMI) is used for the monitoring and control of the sorting process. The next paper was Mechatronic Sorting System for Mechanical Products Based on Machine Vision. The main idea of referring to this paper was to develop a new control scheme for online detection and sorting system. The detection mode with online, real-time, non-contact, high-speed and high accuracy is becoming the characteristic of the industrial manufacturing detection link in recent years, and this requires us to use an appropriate control scheme for production. The next paper was Automatic Sorting System Design for Long Bamboo Batten To effectively and precisely drive industrial cameras to photograph and then sort long bamboo battens, a surface-defect and color detection device and a sorting device are

designed. Further, a sectionalized photography program and sorting program design is proposed. The overall machine employs STM32 as the core master controller, which is connected to the relay drive plate, the photoelectric switch, the industrial camera, etc., The next paper was Vision-Based Sorting Systems for Transparent Plastic Granulate the main idea to refer this paper was Granulate material sorting is a mature and well-developed topic, due to its presence in various fields, such as the recycling, mining, and food industries. However, sorting can be improved, and artificial intelligence has been used for this purpose. This paper presents the development of an efficient sorting system for transparent polycarbonate plastic granulate, based on machine vision and air separation technology. The next paper we referred to was CPS-Based Smart Warehouse for Industry 4.0 This paper discusses how the state-of-the-art techniques in cyber-physical systems facilitate building smart warehouses to achieve the promising vision of industry 4.0. We focus on four significant issues when applying CPS techniques in smart warehouses

III. METHODOLOGY

Before making the project in the end product, some initial and very important steps are taken in consideration. First the estimated block diagram of concept has been made, further refined into a final block diagram with flow of hardware and software compatibility is done.

The diagram below is the block diagram of the project:

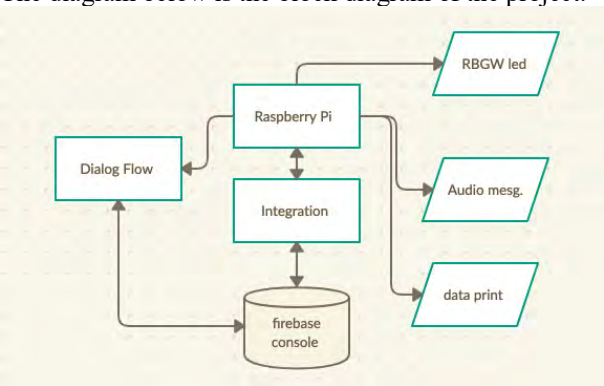


Fig 1: Block diagram of system

Here, the block diagram of the system is shown in understandable manner. The point to be noted is that every block of the system consists of many sub-blocks and a variety of software and hardware processes are involved in these sub-blocks. As seen in the block diagram above, the input is as given as an audio message. It is further being given to the translation block. In the translation block various algorithms are involved to process the speech into understandable text msg. for acknowledgement and to process in further block. Intent matching block understands what the user wants to say in specific, after understanding the intent of the user it further processes what operation and commands needs to perform. As specifically, a query is generated and data is fetched or pushed in the database. Actions and parameter block represent the linkage between the system where hardware and software process are involved. Integration tools can be used to provide linkage with it, any exception handler can be considered in this block. After making specific decision with the data, the database stores the recent data and output is generated can be in updated database, audio message or copy of invoice.

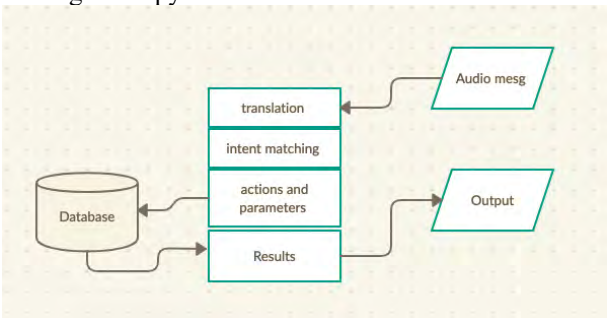


Fig 2: Block diagram of system

Design steps:

Software -
First, we make an IFTTT applet that is triggered when we say "Ok Google, Welcome $", where $ is the name of the individual you would like to welcome.
SQL Database: FindItem - Find an item
FindTags - Find items matching provided tags, colored on a gradient according to number of tags matched
InsertItem - Insert a new item into the organizer
RemoveItem - Remove an existing item from the organizer
AddTags - Add tags to an existing object. Ex: "Add tags diode light emitting to green LEDs"
SetQuantity - Set the quantity of an existing item
UpdateQuantity - Update the quantity of an existing item
ShowAllBoxes - Light up all the boxes which have items in them with random colors
BundleWith - Bundle a new item with an existing item. Ex: "Bundle 8 blue LEDs with red LEDs"
HowMany - Show, in ASCII text on the display, the remaining quantity of an item.
Local Commands:
Welcome - Scroll text across the display, welcoming the specified individual
SetBrightness - Change the brightness of the LEDs
SetDisplay - Turn on and off the display
ChangeColors - Change the color gradient used by the FindTags command
Modifying the Database
Manually editing a SQL database using SQL queries can be a daunting, frustrating, and time consuming experience. So, we need to manually edit a few entries in the database, there's a much easier option using Visual Studio -- No coding required!
Visual studio is needed to update the SQL Database.
Next, navigate to the Azure Portal, click 'All resources'

on the left menu, and click the database:
Click through to launch the Database with Visual Studio:
This will launch Visual Studio, and bring up a prompt for the database password:
associated tags for a given NameKey, with the requirement thatall tags must be a singularized lower-case word.
The NameKey column must be unique within the Items table, and must exist in the Itemstable before adding entries to the Tags table. NameKey should be lowercase and singular. For example, to insert 24 Orange LEDs, the NameKey would be 'orange led'. Relevant tags for 'orange led' may include: orange, led, light, diode, etc. All lower case and singular. Each tag will take a new row in the Tags table, all with the same NameKey of 'orange led'.
To Add an item to the database, first add a row to the Items table, then add as many relevant tags to the Tags table using the NameKey from the Itemstable row. To create a new row, begin by clicking any one of the NULL cells on the very bottom row.
All necessary columns must be populated with valid entries before a new row can be committed to the database. Uncommitted entries will have a small warning beside them, as shown when partially adding an entry for 'orange led'

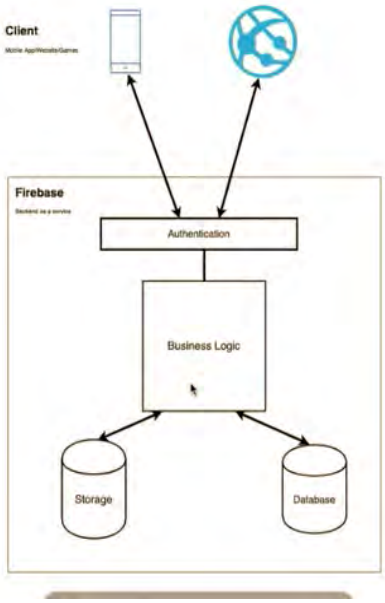


Fig 3: Block Diagram of Firebase.

Firebase (Firebase console)
The Firebase Realtime Database is a cloud-hosted NoSQL database that lets you store and sync between your users in real time. Real Time syncing makes it easy for your users to access their data from any device, be it web or mobile. Realtime Database also helps your users collaborate with one another

Google DialogFlow

DialogFlow is a natural language understanding platform used to design and integrate a conversational user interface into mobile apps, web applications, devices, bots, and interactive voice response systems.

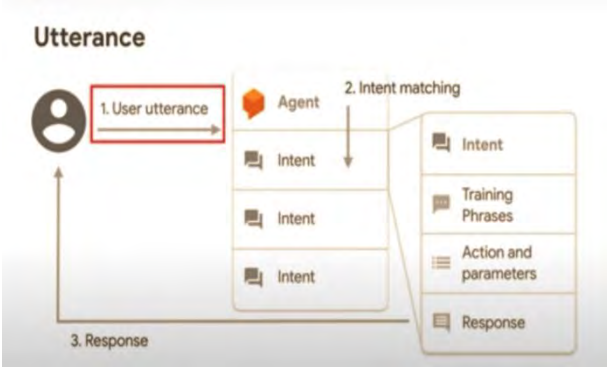


Fig 4: Sequence diagram of Dialog Flow.

Here the possible terms are to be understood.

User Utterance: the voice command translated in string (text) form itself is a user utterance
For E.g., "Hey google, which day is it today"
The sentence itself is user utterance whereas "hey google" is used to trigger the voice command engine and the rest of the sentence is the intent.
Intent: Intent matching or intent shows the list of various operations to be performed after the user utterance is activated.
For E.g., "hey Siri, open smart scheduler"
The above example shows the user utterance, as understood "smart scheduler" apps need to be open by system.
3) Response: The response is given in the form of Pre-recorded voice commands, strings or numerical data.
Here the system consists of simple circuit diagram in which the RGBW led strips are need to place according to the specific product's compartment. Here the given circuit diagram is shown

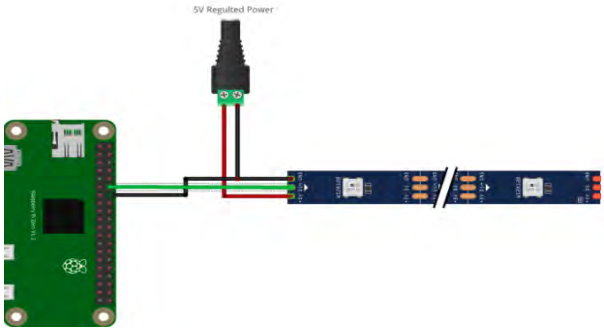


Fig 5: Circuit diagram of RGBW led strips.

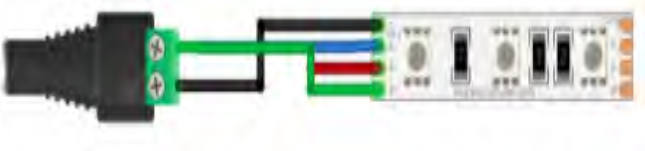
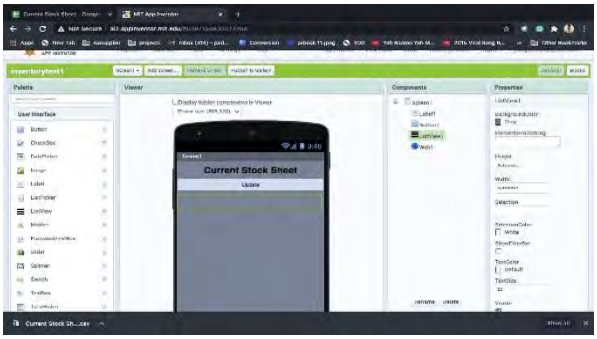


Fig 6: Circuit diagram of connection LED Strips.

IV. RESULT AND DISCUSSION

Fig 7: Current stock sheet

The picture enclosed shows the current status of inventory.
The following details
Invard : the material/goods been purchased from the manufacturer or distributor
Outward: the material/goods been sold to individual/end customers
The outward values are been changed according the voice commands given by the user. The process is been followed as voice engine process the audio signal which fetches the product model description and quantity value as well as rate and process the changes in database. The database reflects the current value.



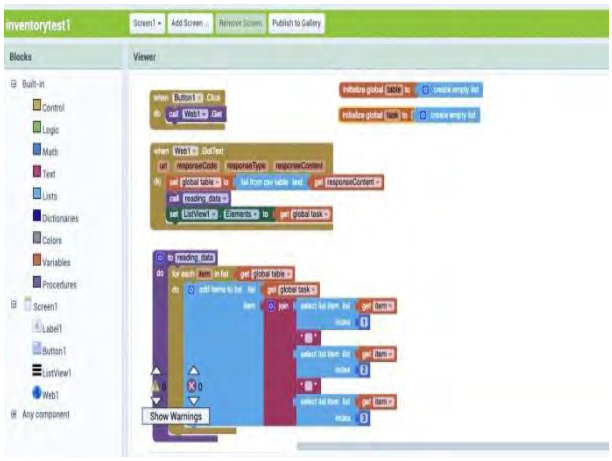
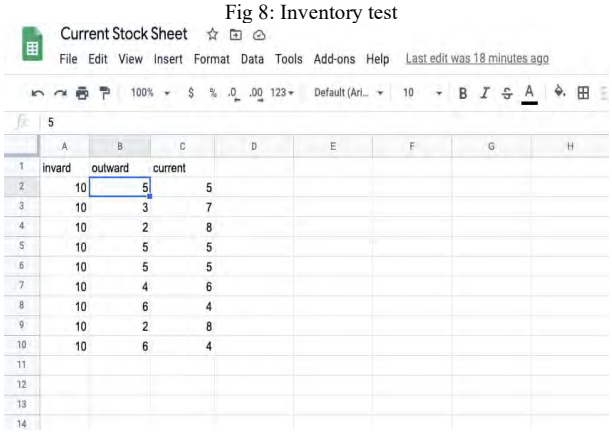


Fig 8: Inventory test

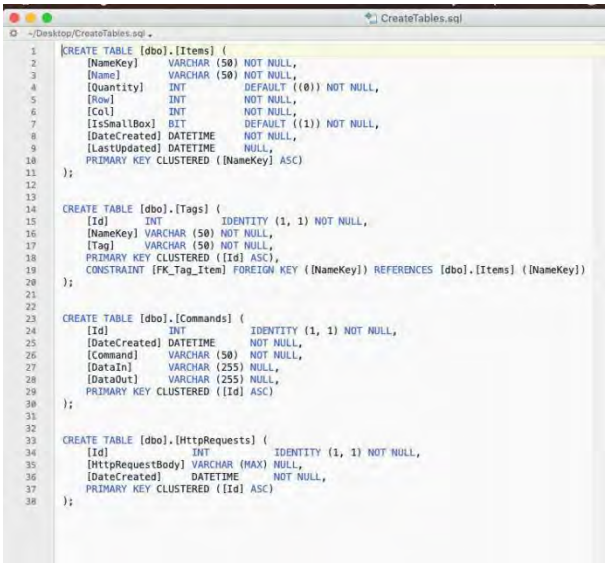


	A	B	C
1	invard	outward	current
2	10	5	5
3	10	3	7
4	10	2	8
5	10	5	5
6	10	5	5
7	10	4	6
8	10	6	4
9	10	2	8
10	10	6	4

Fig 9: Stock sheet excel

The photo shown is the excel, these above integer value is been changed by the process which converts audio signal into text value.

The list shown in excel format will be shown in UI of the application, the purpose of application is for convenience of user, as it is time consuming procedure to check on excel sheet




```
CREATE TABLE [dbo].[Items] (
    [NameKey]     VARCHAR (50) NOT NULL,
    [Name]        VARCHAR (50) NOT NULL,
    [Quantity]    INT          DEFAULT ((0)) NOT NULL,
    [Row]         INT          NOT NULL,
    [Col]         INT          NOT NULL,
    [IsSmallBox]  BIT          DEFAULT ((1)) NOT NULL,
    [DateCreated] DATETIME     NOT NULL,
    [LastUpdated] DATETIME     NULL,
    PRIMARY KEY CLUSTERED ([NameKey] ASC)
);


CREATE TABLE [dbo].[Tags] (
    [Id]      INT          IDENTITY (1, 1) NOT NULL,
    [NameKey] VARCHAR (50) NOT NULL,
    [Tag]     VARCHAR (50) NOT NULL,
    PRIMARY KEY CLUSTERED ([Id] ASC),
    CONSTRAINT [FK_Tag_Item] FOREIGN KEY ([NameKey]) REFERENCES [dbo].[Items] ([NameKey])
);


CREATE TABLE [dbo].[Commands] (
    [Id]          INT          IDENTITY (1, 1) NOT NULL,
    [DateCreated] DATETIME     NOT NULL,
    [Command]     VARCHAR (50)  NOT NULL,
    [DataIn]      VARCHAR (255) NULL,
    [DataOut]     VARCHAR (255) NULL,
    PRIMARY KEY CLUSTERED ([Id] ASC)
);


CREATE TABLE [dbo].[HttpRequests] (
    [Id]              INT          IDENTITY (1, 1) NOT NULL,
    [HttpRequestBody] VARCHAR (MAX) NULL,
    [DateCreated]     DATETIME     NOT NULL,
    PRIMARY KEY CLUSTERED ([Id] ASC)
);
```

Fig 10: Sql code for database

V. FUTURE SCOPE

The system is mainly focused on the commercial sector in which it has been used for the simpler operation for sorting and retracing the product. The end product of system offers the benefits to the vendors, small to very As the need of manual labor for product sorting is eliminated as the system understands the user language, processes and provides respective output and stores information in future. The scope of the project is widely diversified in the fields of finance industries and medical healthcare. The purpose of the system in finance or the possible application of this system is 1) Coin based sorting system which can be automated and in the Medical industry as 1) medicine product sorting and surgical equipment sorting system.

VI.CONCLUSION

In many large scale and small scale field product sorting plays very important role which becomes very complex to find a particular item in the place where all different item are stored individually. So many industries and warehouses they manually check in their system that in which section the particular item is stored. The main aim is to propose an Voice operated system which makes this operation simpler like the user just has to say the particular item name and the voice recognition system will
recognize the users voice and send it to the system and the location of that particular item will be displayed and also it will be indicated with led just below the section where the item is been stored also the user can remotely access this from a long distance through the mobile phone to check the stock update and also for sortingsend it to the system and the location of that particular item will be displayed and also it will be indicated with led just below the section where the item is been stored also the user can remotely access this from a long distance through the mobile phone to check the stock update and also for sorting

VII.ACKNOWLEDGEMENT

This project cannot be entirely created by an individual. The timely completion of the project 'Voice control based multipurpose product sorting system' has been possible because of our teacher and project guide Mrs. Sujata Alegavi who provided us with guidance and motivation throughout its making. We thank her for giving us an opportunity to create this project.
We are also thankful to Dr. S.C. Patil (Electronics Department, HOD) for his guidance and to our parents for providing all possible resources to gain the best possible knowledge.
Finally, we would thank our college 'Thakur College of Engineering and Technology' for providing us with a platform and the necessary facilities to make this project large scale, due to which end customers or the user's client avails the benefits such as improved safety, faster shipping and easily traceable.

REFERENCES

[1] Manjunatha, "Postal Automation System for Mail Sorting", International Journal of Emerging Technology and Advanced Engineering, vol. 5, no. 3, March 2015, ISSN 2250-2459.

[2] Saurin Sheth, Rahul Kher, Rushabh Shah, Parth Dudhat and Pratyush Jani, Automatic Sorting System Using Machine vision.

[3] Prof. Nilima Bargal, Aditya Deshpande, Rucha Kulkarni and Rucha Moghe, "Plc Based Object Sorting Automation", Journal of IRJET and Applications

[4] Albert T. Jones and Charles R. McLean, "A proposed hierarchical control model for automated manufacturing systems", National Bureau of Standards.

[5] Pradeep Reddy; Pooja Honnutagi, "Wireless LAN technology and voice recognition in warehouse management system", Conference paper, 2014 IEEE.

[6] Y V Aruna and S Beena, "Automatic convey or System with In-Process Sorting Mechanism using PLC and HMI System", Int. Journal of Engineering Research and Applications, vol. 5, no. 11, pp. 37-42, November 2015.

[7] Conference: Multi Disciplinary International Symposium on Control Automation & Robotics At DDIT, vol. 1.

[8] D. A. Wahab, A. Hussain, E. Scavino, M.M. Mustafa and H. Basri, "Development of a Prototype Automated Sorting System for Plastic Recycling", American Journal of Applied Sciences, vol. 3, no. 7, pp. 1924-1928, 2006.

[9] G. Ioannides Maria, Design and Implementation of PLC-Based Monitoring Control System for Induction motor.

[10] Jarimopas Bundit and Jaisin Nitipong, "An experimental machine vision system for sorting sweet tamarind", Journal of Food Engineering, vol. 89, no. 3, pp. 291-297, December 2008.

[11] D. Bulanon, T. Kataoka, Y. Ota and T. Hiroma, "A Machine Vision System for the Apple Harvesting Robot", SICE 2004 Annual Conference, 2004.

[12] Sergio Cuberob Gamal E1 Masrya, Moltób Enrique and Blascob José, "In-line sorting of irregular potatoes by using automated computer-based machine vision system", Journal of Food Engineering, vol. 112, no. 1–2, pp. 60-68, September 2012.

[13] H. Isil Bozma and Yalcin Hülya, "Visual processing and classification of items on a moving conveyor: a selective perception approach", Robotics and Computer Integrated Manufacturing, vol. 18, 2002.

[14] J Blasco, N Aleixos and E Moltó, "Machine Vision System for Automatic Quality Grading of Fruit", Biosystems Engineering, vol. 85, no. 4, pp. 415-423, August 2003. automated computer-based machine vision system", Journal of Food Engineering, vol. 112, no. 1–2, pp. 60-68, September 2012.

[15] V G Narendra and K S Hareesha, "Prospects of Computer Vision Automated Grading and Sorting Systems in Agricultural and Food Products for Quality Evaluation", International Journal of Computer Applications, vol. 1, no. 4, pp. 1-9, 2010, ISSN 0975-8887.

[16] Md. Rokunuzzaman and H. P. W Jayasuriya, "Development of a low cost machine vision system for sorting of tomatoes", Agricultural Engineering International: CIGR Journal, vol. 15, no. 1, pp. 73-180.8, Mar 2013.

[17] W. Zhang, J. Mei and Y. Ding, "Design and Development of a Hight Speed Sorting System Based on Machine Vision Guiding", International Conference on Solid State Devices and Materials Science, 2012.

[18] Amol Nandu Ahire, Manoj Ravindra Fegade and N., "RGB Color Sensor based Object Detection & SCADA", Avadhoot R. TelepatiI, pp. 28, 2018.

[19] Prashant M. Jadhav, "Colour Object Counting and Sorting Mechanism Using Image Processing", Approach. Scientific Journal Impact Factor (SJIF), 2015

[20] "A Novel Design of a Robotic Object Sorter Based on Color Differences using Image Processing Techniques", 2016 International Conference on Computer Communication Chemical Material and Electronic Engineering (IC4ME2), pp. 1-4, 2016.

This page is kept blank intentionally

Coin Sorter Using Arduino

Aneesh Patne
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
aneeshpatne@gmail.com

Gauravkumar Singh
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
iamgaurav2001@gmail.com

Jashbeersingh Rana
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
ranajasbir.29@gmail.com

***Abstract*— Separating, sorting and counting coins of the different and same denomination is an activity that demands accuracy, speed and reproducibility. The coin sorter-counter will count as well as sort the coins. The sorter can sort between 3 denomination of coins and give visual feedback when a coin is detected. The coin sorter can count until the container is full and will display the total amount and the individual count on the screen and has 2 RGB LEDs to let the user check that all sensors are working. The sorter is faster and more accurate than manually counting the coins.**

Keywords—Sorting, Counting, LED, PIR, RGB

I. INTRODUCTION

In the India, coins began anywhere between early 1st millennium BCE to the 6th century BCE. Back then coins were made of rare earth minerals. Until now, people still use coins in their everyday lives. There are those that deal with coins everyday like banks, transport and informal markets which lack access to the online mode of payment

Nowadays, checks, credit cards and automatic debit cards are being used instead of coins and bills in many transactions. Despite this, the number of effective transactions, mainly those of low value, still imply a broad manipulation of denominations by financial institutions, cash transportation enterprises, supermarkets, pharmacies and all kind of commerce organizations

Meanwhile, a coin segregator is another technological advancement in the banking industry. Coin sorting machines have the ability to sort from a random collection of coins into separate bins for different denomination. The concept of the coin counter is mostly based on the detection of the dimension by using sensor. The coin sorting tray is designed to sort different type of coins based on the size of coin in different denomination.

The extent of the coin segregator covers only 3 different coins namely 1, 5 and 10 Indian rupees coins. After the segregation of coins, it will be printed on a LED display.

II. PROBLEM DEFINITION

Main problems that were identified which the project is trying to solve are Effective and cost-effective means to differentiate the coins while being time efficient and accurate. After the coins are sorted use of a proximity sensor used count the coins and while speed and accuracy in acceptable range. The total amount and the count both to be displayed to the user.

III. MOTIVATION

In India Local vendors usually have a lot of spare "change" the counting of the coins are quiet laborious because the person has to count as well as do calculations mentally to calculate the total amount and now the onset of vending machines which totally rely on sensors on counting the coins this project was perfect was chosen. This system can not only count the number of coins but also display the total amount which is very beneficial.

IV. LITERATURE SURVEY

The concept of a coin sorter was envisioned many years ago earlier systems solely relied on mechanical ways of sorting the coins and lacked any logic and were simply mechanical tools which lacked the accuracy and speed. The earliest mention of these types of sorter was done 1957 these systems relied on sorting based on the size of the coins and lacked the ability of counting the coins.

As the time moved on the sorters stated to incorporate microcontrollers and sensors rather than simply relying mechanical parts. The inclusion of simple ICs is done which use proprietary language and coding methods which are cumbersome to troubleshoot. The main system usually involves a proximity sensor in form of an IR sensor or an ultrasonic sensor and for segregation of coins different slots are used which only allow a certain denomination of coin to pass through. There were several other approaches to counting coin a paper validated the idea of counting coins simply using visual sensors were the process was laborious and lacked the accuracy of a system which used proximity sensors.

There was no clear coconscious amongst the papers regarding the use of any specific proximity sensors i.e.

shortcoming or advantages of a sensor over another mostly projects either relied on IR or an ultrasonic sensor. There was a clear lack of redundancies in case of a coin being not sorted or counted and the relation or the tradeoff between speed and accuracy was also not that thoroughly documented.

V. PROPOSED DESIGN

For the detection of the coins 3 PIR sensors is to be used which will be connected to the digital pins of the Arduino after that a variable can be incremented which can calculate the total number coins For allowing new coins to enter the detection center a servo motor will be used. For displaying the Amount of coins a 16x2 LED is to be used

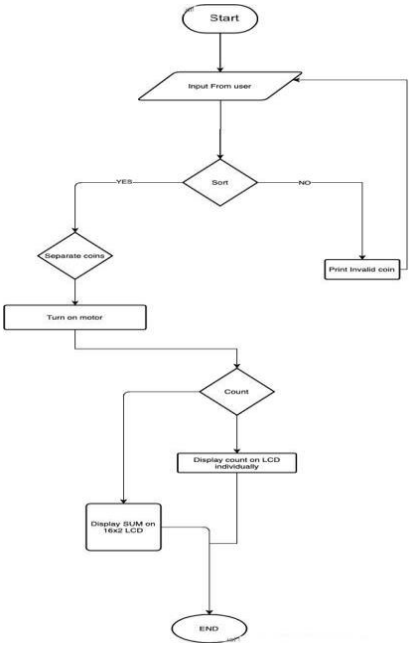


Fig.1. Data flow diagram

VI. RESULTS & DISCUSSION

Initially all the numbers corresponding to the coins for 10, 5, 0 are displaying zero as expected and the RGB led is glowing RED corresponding

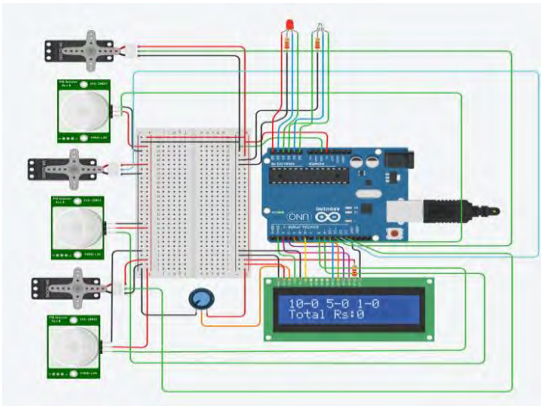


Fig.2. When the coin sorter is started

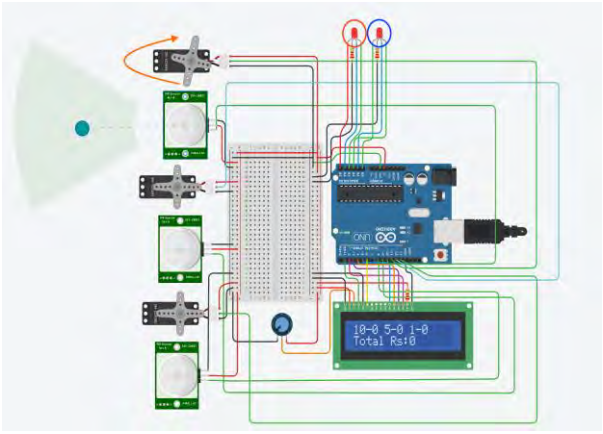


Fig.3. Working when one PIR sensor is activated

The coin sorter is working as intended and the LCD display which was connected by including library liquidcrystal.h displays both the total amount and the count of the individual coins

An additional 2 more RGB leds were also included which give visual feedback to the user in form of blinks when a sensor detects a coin and the LED is simply used to give a response to the user corresponding to the total amount accumulated. In whole the coin sorter is working as intended and is only limited now by the fact that it is being simulated and not made practically and the system meets and solves all the problems highlighted in the problem definition section.

VII. SCOPE OF PROJECT

The Coin sorter can be of use in many domains in India it may be used domestically as well as commercially, Currency counters are commonly used in vending machines to determine what amount of money has been deposited by customers. The wending machines are autonomous in nature and solely depended on coin sorter to keep accounts in the machine. The use of this machine is also in domestic setting if produced in an way where the cost of the sorter is economical it can be of immense use in day to day life keeping accounts of the total amount of coins as well as feature of dispensing coins can also be added later to aid the daily life. A sorter can be both faster and more accurate than counting the coins manually.

VIII. CONCLUSION

The design of coin sorting machine with using PIR sensor is finally realized, which can realize the coin sorting and counting. The counting results will be displayed on the LCD screen through the operation of the Arduino. The coin sorter is simple in design and easy to operate. It can solve the problem of difficult to recycle coins well in places with large coin circulation, such as bus companies, supermarkets and financial departments.

Manual method can be completely replaced by this proposed method. Time consumption in counting the coins is very much reduced and the accuracy is also greatly improved. Proposed model can be used widely in donation boxes and other places like charities, where we have to separate and estimate the coins and currency.

It can be of great use in houses and small commercial establishments due to its low cost and it being relatively easy to use.

REFERENCES

[1] Prashanna Rangan "Machine Vision Based Coin Separator and Counter" https://www.researchgate.net/publication/32515 3815_ Machine_Vision_Based_Coin_Separator_ and_Counter

[2] Li Feng1, a, Ning Tingzhou2 Design of Coin Sorter"

This page is kept blank intentionally

Website for Infographics of New Education System

Shweta Chavan
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
shwetachavan0102 @gmail.com

Roshini Kini
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
roshnikini30901@gmail.com

***Abstract*— Website for the New Education Policy is our goal. There are not many websites which clearly indicate every bit of changes in the education policy. Our website aims to help the locals with the new updates of the education policy, 2020 with the help of infographics and attractive stuff so that it becomes easier to understand. This website will be of great help to a large public right from student level to mentor level. The website contains various segments for various categories of education. We have added an faq section too, as well as question answer section to make it user-friendly. We have majorly made use of HTML and CSS codes.**

Keywords— New education policy, HTML, CSS, infographics

I. INTRODUCTION

The draft of new education policy of India was released first in the year 1986, by the government led by Mr. Rajiv Gandhi. The second-most renewal of the Education Policy was done in the year 2020, the current year, by the government led by Mr. Narendra Modi. The new education policy is highly appreciated by every citizen of India, because of the changes brought in this one. But the implementation of the system would be done in a couple of years. As of now there are many websites which are providing trivial information about the policy, but not even a single which provides complete information in a very user-friendly way. The government itself has released a document online which is in the .pdf format, which, of course is not feasible to the general public due to the vast readings. The other websites, while the literature survey, were found out to be providing information on a single topic, without complete information in a nutshell. The locals would really love to access the information that they want in a very easy manner that won't take their much and space in their device as well. Hence, our group came up with the idea of providing a website to the locals which would not only give the complete information about the New Education Policy, but also have some creatives to attract the audience. The website would also have the link to the best website consisting of the latest news in it. We have also planned to schedule events once in a while, for which we have included the registration link in the website. The website would be subdivided into categories as per proposed by the government. The categories would have the 4 stages of the educational divisions. Clicking on each one of them, would lead to other page where the complete information would be provided. We have included the resource materials as well, separately for the categories as well. For any kind of queries, they can fill it up in the google forms provided to them on the website. The infographics are available for each of the category on the page. The website, as we hope, would be of great help to the general public to access all that they want about the new education policy.

II. PROBLEM DEFINITION

The problems identified were such that they were found to be solvable just by making a user-friendly website. The readers would really find it difficult if there were no website for providing the resource materials. The users would have a lot many doubts, there should be a platform for the discussion of the same. The users would want a well-segregated, well-organized website, where they could easily find the personalized data. The existing, messed up form of data was not really appreciated.

III. MOTIVATION

Motivation of the project came from the pre-existing hefty websites about the new education policy. These hefty websites were so much cliché that we chose to make a website ourselves, which would have all the information required. The websites also didn't attract any public because of the monotonous piece of information. We hence got motivated to create all new website called 'NExPlain' which would include infographics, the resource materials and many more interesting stuff.

IV. LITERATURE SURVEY

A survey was conducted and the NEP 2020 was compiled in a pdf format of around 60 pages. In the National Education Policy 2020 proposed by, the Ministry of Human Resource Development, Government of India. The gaps identified were that, the pdf was not user-friendly at all. It only had most of the authoritative data in it which the user might avoid reading. The document was too lengthy and was written in a formal way, for the officials, which again, the user would wish to skip.

'A deeper look at India's New Educational Policy 2020' by Naina Elizabeth Matthew and Tim Zubizarreta gave a very little brief about the exact system of 5+3+3+4. It seemed to be more of language oriented data. Although it covered a few points regarding the benefits of the NEP 2020, it had too many loopholes. It mentioned the impact of NEP 2020 on the locals, which was pretty impressive. The gap found was lack of information.

The website New Education Policy 2020 (NEP 2020): Highlights and PDF Downloads by Usha, NoticeBard was found to be quite user-friendly. It had the perfect and precise information about the split up of the grades. The website also had a plus point in the matter that it had a pdf in Hindi language too. But the gap found was it did not explain anything about the existing NEP and did not even compare the new NEP to the old one.

V. PROPOSED DESIGN

We tried connecting the public with the virtual world for the new education policy. We planned for making a user-friendly website, where the general public won't find it difficult to access the data easily. The website begins with a title page, which on clicking the title leads to the homepage. This home page has link to the best available site which has the relevant news about the current topics. The homepage also has a link to the marquee texted new events, which leads to a google forms for people to register themselves for the upcoming events. There would also be another page which again redirects the page to the index page. The home page was completely made with html and for styling the css was used and linked together. The index page has the main content, where we have linked the redirection to 4 categories, via buttons. This page also has a QnA and a FAQs buttons, which lead to google forms and a page respectively. The QnA has a google form which collects the queries of the readers and stores it for further help. The most asked queries would hence be displayed in the FAQs section along with the answers. There is another linked to index page, which provides guidelines to the teachers. This also has a back button, which will always take you to the home page. The index page has a direct link to the official pdf released by the government about the new education policy. Then we have the 4 categories, if we select the foundation stage, we have two buttons, one for the infographics, on clicking this button, we get the creative image of the foundation stage, which can also be downloaded and shared amongst others. The foundation page even has the button for resources, on clicking this button; we get all the links of the resource materials required for the foundation stage classes. On clicking the required link, one can download the pdf of the whole book. The foundation stage page also has the button which redirects to home page. You can select any of the pages from the middle, secondary and pre-primary stages to get the information regarding the particular grades. Every page of the website has a creative background added too!

The major objectives involved in project planning are listed as follows -

- To create a website that has all the required information about the new education policy, 2020.
- To add a lot of creatives in the website to attract more audience.
- To transfer the information in a pictorial way, which will be easier to understand.
- To help people understand and ask queries privately to us.
- To clear all the doubts of people by adding a FAQs section.
- To help people access the resource materials for free.

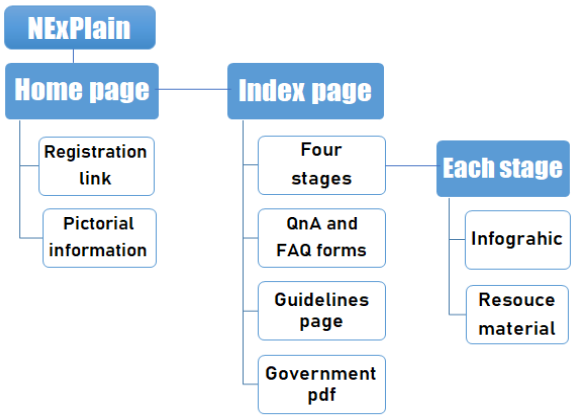


Fig.1. Data flow diagram

VI. RESULT & DISCUSSION

This is project aims to deliver the information on the new education policy in a more accessible, creative and user friendly format.

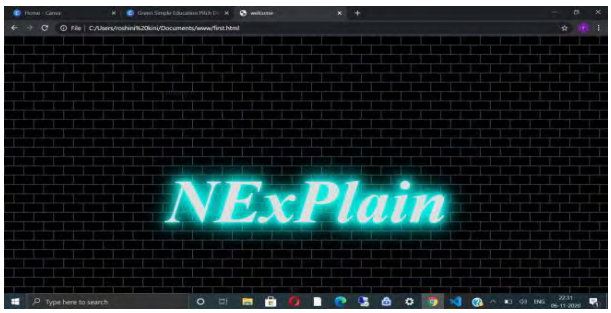


Fig.2. Title Page

The first page is a title page with our website name as shown in figure 2. On clicking on the name the user is redirected to the home page. The name is animated using neon hue and it changes within 5 secs. This was done to gain interest of the users.

The next page is the homage it has a register now marquee scrolling from left to right on top to draw the required attention on new event for which the user can register. It also has two buttons one leading to index page and the other to pictorial info.

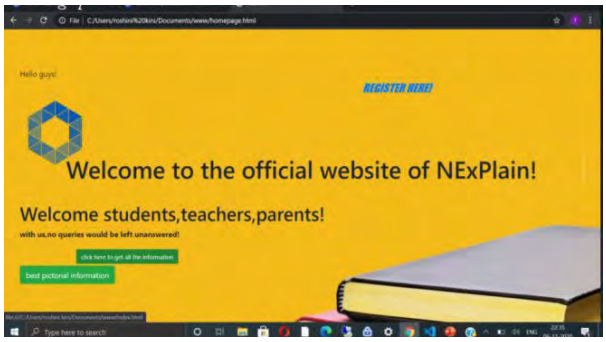


Fig.3. Home page

The index page is made quite user friendly and easy to navigate. It has eight buttons. The school education is divided into four stages as per the NEP. Similarly we have divided those stages in four different pages. A QnA Google form to take the queries and a FAQ page with all the solutions is linked. Guideline page and the official Government pdf are also linked via the buttons.

Fig.4. Index Page

The four pages of the different stages each consists of two buttons. One button opens a pop up container which consists of all the resource materials for that particular stage. The other button gives an info graphic designed for that stage. Both these contents are downloadable which will also allow the user to share it. The container also has an option to go back to home page directly or simply come back to index page.

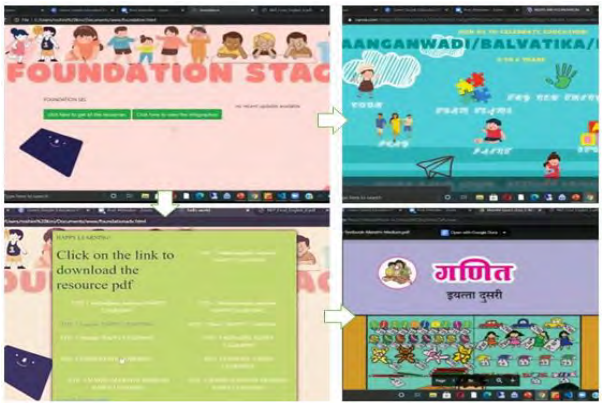


Fig.5. Foundation stage

In figure 5 the various navigations in the foundation stage are shown. Similar to the foundation stage we have the preparatory stage, middle stage and secondary stage. Each with the same features. This segregation allows the user to access the information in a much faster and hassle free manner.

Fig.6. Glimpses of the other stages

To have an interaction with our users and to understand their queries or get a feedback we have a QnA section. The users can send us their questions or suggestions. We will respond to them privately or the most asked questions will be answered in the FAQ section

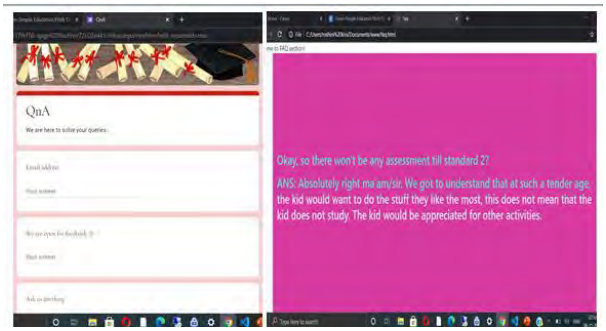


Fig.7. QnA and FAQ section

Finally we have a page to provide guidelines to the teachers. There are various people, who can benefit from this page like tuition teachers, aspiring teachers,

amateur NGO volunteers and various big and small organizations. The text on this has a flip animation and the heading has a glamour effect.

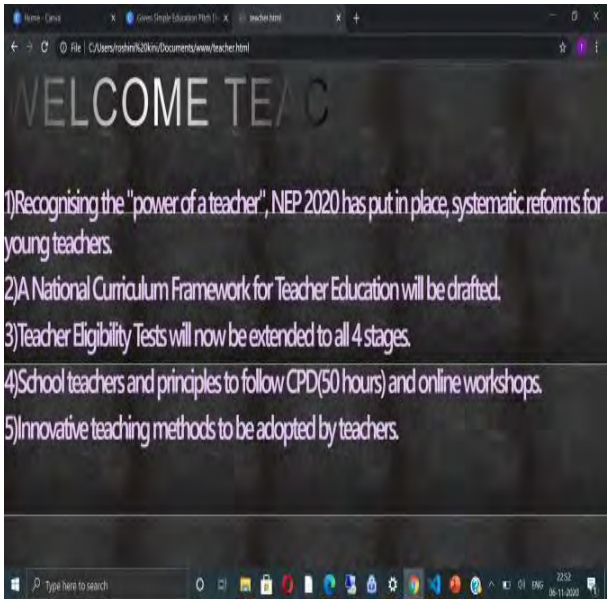


Fig.8. Guidelines page

VII. CONCLUSION

The project was successfully implemented with all the necessary features. The main task was to make a site which is easy to navigate and understand by the audience. The use of various animation codes was done to draw the attention on certain links. It was not enough to just provide the information which already exists. So we also kept doubt solving section, and hosted zoom meets, provided new updates and a wide range of materials for every standard. The website caters to all kinds of users be it students, teachers or parents.

REFERENCES

[1] https://www.google.com/search?q=geeksforgeeks&rlz=1C1CHBF_enIN859IN859&oq=geeks&aqs=chrome.1.69i57j0i433i457j0i433l3j0j0i433l2.2882j1j7&sourceid=chrome&ie=UTF-8.

[2] https://www.google.com/search?rlz=1C1CHBF_enIN859IN859&sxsrf=ALeKk00YbUVVIkH_ye3xrmzjO2A4qN08Cg%3A1606118498949&ei=Ymy7X_3COcSE4-EPz96ByAI&q=tutorialspoint&oq=tutorial&gs_lcp=CgZwc3ktYWIQARgAMgoIABCxAxDJAxBDMgcIABCxAxBDMgUIABCxAzIHCAAQsQMQQzIECAAQQzICCAAyAggAMgQIABBDMgIIADICCAA6BwgjEOoCECc6BAgjECc6CAgAEMkDEJECOgUIABCRAjoICAAQsQMQgwE6CAguELEDEIMBOggILhDHARCjAjoOCC4QsQMQgwEQxwEQowI6CwguELEDEMcBEKMCOgIILjoFCAAQyQM6BwgAEMkDEA06BAgAEA06BwgAEMkDEEM6CQgjECcQRhD5AToFCC4QsQNQqvMDWPu2BGC3xwRoFXABeACAAdsBiAHiIJIBBjAuMjYuMpgB.

Implementation of Departmental Time Table Generator

Shouvik Roychowdhury
Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai,India
shouvik2641@gmail.com

Mrs. Archana Desphande
Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai,India
Archana.deshpande@thakureducation.org

***Abstract* — Timetabling has been of interest for decades, and it always has been relevant in practice. Indeed, it has been implemented in education, health, manufacturing, etc. Producing a conflict-free timetables for schools and in education generally is a tedious process due to the complexity of factors to be considered and the size of search spaces. Over the years, various approaches have been adopted, but none of them is standard. That is because every timetabling or scheduling problem is unique. Consequently, it is harder to decide over different approaches and appropriately write a linear programming model for it. This project introduces a practical approach completely functional timetabling algorithm capable of dealing with both strong constraints and weak constraints effectively in an automated timetabling system rather than manual approach. So that each teacher and student can see their timetable once they are built and finalized for a given semester.**

Keywords— Genetic Algorithm, Constraints, Python, SQL Lite, Machine Learning

I. INTRODUCTION

Creating manual timetable for colleges requires us finding some time slots, teacher loads and classrooms which satisfy the constraints given on offered courses, lecturers, classrooms and so on. Since the problem is a combinational optimization problem, the computation and logical thinking time for timetabling tends to grow exponentially as the number of constrains increase.

For the purposes of this project, genetic algorithm will be used to slot in the lectures to timeslots. Genetic algorithm is an Artificial Intelligence technique that mimics evolutionary biology as its way to learn from its mistakes and get smarter and closer to the desired output. Genetic algorithms simulate the process of natural selection which means those species who can adapt to changes in their environment are able to survive and reproduce and go to next generation. In simple words, they simulate "survival of the fittest" among individual of consecutive generation for solving a problem. They many used for generating solution involving optimization and search problems.

II. LITERATURE REVIEW

Throughout the years there have been several ways in which timetabling is done, such as greedy algorithms, constraint programming, heuristic programming and genetic algorithm.

1) Greedy Algorithm – Greedy algorithm is a type of programming technique that builds the solution piece by piece, choosing the next block or piece based on how beneficial it is to the solution required. Based on this nature a greedy algorithm is mainly used for optimization techniques where one to maximize or minimize a given set solve a problem. This kind of algorithm is much easier to implement and analyze which makes it quite desirable when dealing with smaller data sets.[1]

2) Bipartite Graph Edge Coloring - The timetable scheduling problem is known to be non-deterministic polynomial time (NP) complete problem one of few problems that must be solved by heuristic approach. Graph coloring is one such heuristic algorithm that can deal timetable scheduling satisfying changing requirements, evolving subject demands and their combinations. For solving Course Timetable scheduling problems using graph coloring, the problem is first formulated in the form of a graph where courses act as vertices. Depending on type of graph created, edges are drawn accordingly. One type is conflicting graph where edges are drawn between conflicting courses having common students. Other one is non-conflicting graph, where edges are drawn between mutually exclusive courses having no students in common. Bipartite Graph Edge coloring has a 79 percent success rate [4].

3) Tabu search – Tabu search is a metaheuristic approach developed in the 1960s, it is a local search optimization technique used for mathematical optimizations. TS enhances the performance of these functions by providing user defined rules known as constraints, TS enhances the performance of these techniques by prohibiting already visited solutions or others through user-provided rules. TS generates a series of different sets of integer variables which are called candidates. These candidates differ by one or more bits from the current best solution and are not included in the tabu list. NLP subproblems are then solved for each candidate using the gradient-based method. Among all the new candidates, the one with the best objective value is selected and treated as a seed to generate the next generation of candidates. Small datasets take less than 60 seconds to reach optimal solutions, while medium and large datasets take 4-8 hours based on the complexity of each dataset.[6]

III. GAP IDENTIFICATION

Scheduling classes in an institution is one of the tasks that can be categorized under operations management.

Scheduling classes is often done by humans which proves to be efficient but does not mean it is perfect. Using computers to find the best solution for this problem using conventional method is extremely inefficient. Computers were therefore ignored for a time when solving such problem. However, rise in computing power and usage has opened ways in solving scheduling problems. Creating schedules is done better by humans than conventional computing techniques because humans have powerful brain to assess constraints and combinations better. However, scheduling is known to be non-deterministic polynomial time (NP) complete problem where in order to find the best solution, every possible combination should be executed. Humans cannot compute every possible combination and therefore solves the problem by just filling up and making sure that the constraints are met. This is known to be "good enough" solution. Replicating this technique requires a brute force method using what is known as greedy algorithms, this method is extremely inefficient and unreliable due to high computing cost required. On the other hand, the problem with Tabu search is that it has a tendency to be stuck on in suboptimal regions, not really getting the optimal solution as a result.

IV. PROPOSED ALGORITHM

In genetic algorithm, a solution is referred to as chromosome instead of an individual. Generation of population is done by the random function, used to populate the entire table. After this process the generations are evaluated and given a value known as the fitness of the chromosome. Calculating the fitness is done by assessing each chromosome to the selected medium and soft constraints specifically the subject placement, lunch break, section rest, section idle time and meeting pattern. Once fitness for all chromosomes of a certain generation is complete, the best of the generation is carried forward by a process known as crossover. Its similarity can be seen with that of biological evolution where only the best survives. There is also the factor of mutation to take in place where we take selected chromosome and force mutation to them, usually done so that the solution isn't stuck at a local maxima. The mutation rate is fixed and is hardcoded in the program.

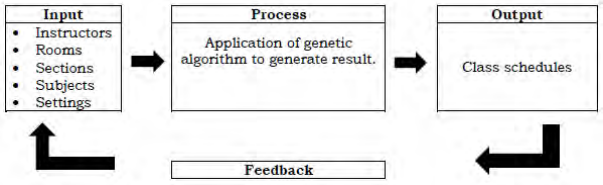


Fig.1. – Simplified input-output model

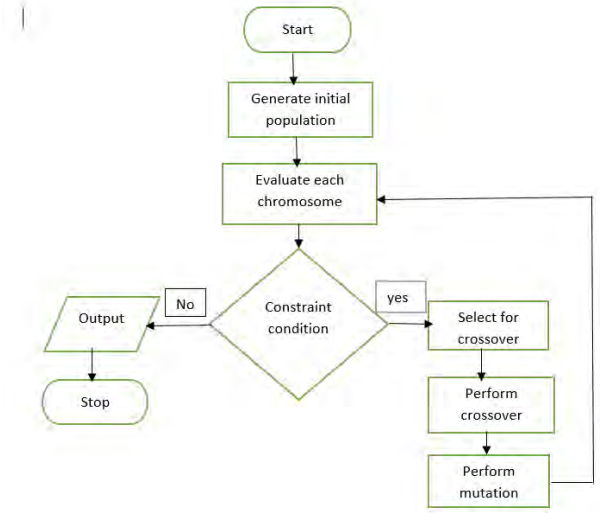


Fig.2. - Flowchart of working of Genetic Algorithm

V. RESULT

The usage of models was meant to test the capabilities of the artificial intelligence. Judging by the performance of results compared to models, the system was able to generate solutions that have at least 80% fitness (basing on set of highest solutions per scenario). The problem lies on the inability of artificial intelligence to perform minor corrections on adjusting schedules (see generation results category "C"). Nevertheless, the algorithm was able to cater for majority of the entries on the evaluation matrix. As given in the screenshots mentioned below, the initial result of the first generation is seen where the best result has 8 conflicts. After 140 generations the best generation has 0 conflicts.

Parameter	Value
Initial Population Size	9
Crossover Rate	0.6
Number of Conflicts at generation 0	8
Number of conflicts at Last generation	0
Average number of Generations	76

Fig.3. – Data set for program

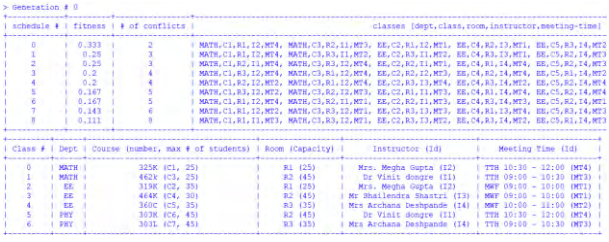


Fig.4. – Generation zero

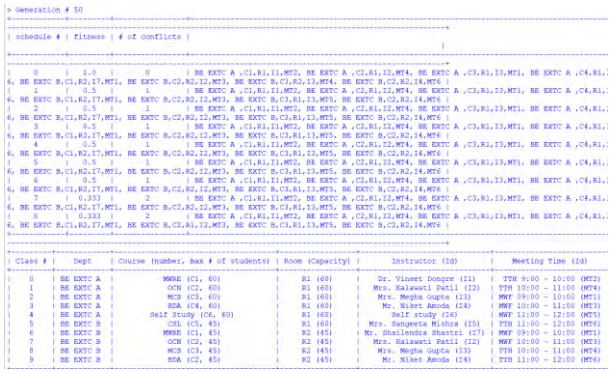


Fig.5. – Generation 50

VI. CONCLUSION

In this Phase-I of project, the literature survey conducted on Departmental Time Table Generator shows that there are many ways to implement this task but using constraint programming gives the best results. After researching extensively, the idea of genetic algorithm was used to sort the data which for now is hardcoded in Python, one of the planned upgrades is to use a database to take inputs from the user instead. There also remains some mistakes made by the algorithm which requires to be smoothed out as time goes on. Lastly, once all this is done a user interface is planned for better usability. Future Plans of this project is to make to a login system to work in conjuction with the database where all users can be given roles such as system admin, content moderator etc. this is to make the system more robust and usable to a wider audience and log ever change a user makes. This would also require a much friendlier user interface to be put in place so that anyone without the knowledge of programming can use this software.

REFERENCES

[1] M.F.M. Sabri and M.H. Husin, S.K. Chai "*Development of a Timetabling Software Using Soft-computing Techniques with a Case Study*". IEEE Date of Conference: 26-28 Feb. 2010 INSPEC Accession Number: 11259665

[2] A. Nanda, M. P. Pai, and A. Gole "*An Algorithm to Automatically Generate Schedule for School Lectures using a Heuristic Approach*" International Journal of Machine Learning and Computing, Vol. 2, No. 4, August 2012

[3] Essakhri, C., & Kissani, I. (2018). "*Multi-Level Assignment Problem for A Conflict-Free Timetabling*". 2018 IEEE International Conference on Technology Management, Operations and Decisions *(ICTMOD)*. doi:10.1109/itmc.2018.8691229

[4] A.R. Hafiza and I. Zaidah, "*Bipartite Graph Edge Coloring Approach to Course Timetabling*". IEEE, pp 229-234, 2010.

[5] A. Chowdhary. "*Timetable Generation System*", International Journal of Computer Science and Mobile Computing, Vol.3 Issue.2, February- 2014, pg. 410-414

[6] H. Turabieh and S. Abdullah, "*Incorporating tabu search into memetic approach for enrolment-based course timetabling problems*," 2009 2nd Conference on Data Mining and Optimization, Kajand, 2009, pp. 115-119, doi: 10.1109/DMO.2009.5341901.

This page is kept blank intentionally

Streamlining The Hospital Management Sytem For Current and Future Pandemics

Shefali Jadhav
E&TC department, Thakur College of Engineering and Technology,
Mumbai,India,
jadhavshefali19@gmail.com

Gagan Jain
E&TC department, Thakur College of Engineering and Technology,
Mumbai,India,
gaganjainwrk@gmail.com

Ananya Koppar
E&TC department, Thakur College of Engineering and Technology,
Mumbai,India,
ananyakoppar@gmail.com

Niket Amoda
Faculty, E&TC department, Thakur College of Engineering and Technology,
Mumbai, India,
niketamoda@gmail.com

***Abstract*— The purpose of the project entitled as "Streamlining the Hospital Management System for Current and Future Pandemics" is to make the current hospital management system more efficient such that patients/staff can register appointments faster with less redundancy. It also provides users with relevant information according to recent news and help them stay informed in situations like the covid-19 pandemic. Hospital stall will be able to register the patients into a unified system and book appointments for any hospital through a single portal which traditionally was done by using a separate portal for each hospital. This enables faster retrieval of data and reduce the time lost in creating multiple accounts. The system can contain all the patient info in a single database for easy access by each hospital during registration. The system is built using WordPress and MySQL for its front-end and back-end respectively, as it stands the system in its testing stage performed much more efficiently than the existing system by significantly reducing the time required to do essential tasks by up to 65%.**

Keywords*— *Hospital Management, Pandemic, Database Management, Time Saving, Wordpress, SQL

I. INTRODUCTION

The current HMS is efficient in storing and retrieving data but is lacking in certain departments, these systems are aimed to provide a backup of patient data by storing it in a database but do not help in reducing the time that is wasted in the physical paper formalities, as per the research done in previous years [1], the DBMS varies from hospital to hospital, each with a different set of requirements and procedures that vary in complexity ,there doesn't exist a single DBMS that provides a viable link between various hospitals that can be used in order to minimize the time lost while registering an appointment in any given hospital.

In this pandemic, getting an appointment requires a lot of redundant steps with regards to the booking system for each hospital. It was observed that for every hospital the information required from the patient was the same but had to be inserted separately for each website as all the database management systems were different from one another.

This project aims at mitigating these redundant steps by providing a single portal created using Wordpress and MYSQL, the website will make it so that no issues related to software will occur during the day to day usage of the system along with this it also ensures that it unifies all the different management systems across hospitals in order to give the users/staff a single place to register appointments by using a one-time data entry for the user's personal information, hence, all hospitals can adopt a unified system such that the entire system becomes streamlined making it easy to merge and access patient records from any hospital.

II. CURRENT SYSTEM DRAWBACKS

In Reference [1], the management system designed for the management of the hospital database was done using Java, this made it so that any hospital that wanted to use this program must be equipped with the necessary tools in order to install and run the program along with the required training needed to be given to the hospital staff to troubleshoot various common problems related to program compilation and run time errors which would be difficult for hospitals in rural areas with less technically aware staff.

This similar issue was also found in the papers referenced [2,3], in addition to the problems mentioned before, the systems proposed in these papers were less user friendly, the time complexity of the registration process remained the same if not worse for these systems. They did not overcome the problems of concurrent data access as well as biometric authentication to keep the patient data confidential and secure [4]. Along with these a few smaller issues related to accessing data such as the various migration procedures, integration of the system with other open-sourced APIs and transferring the data from one database management system to another were not discussed explicitly in any of the papers.

There is still an opportunity to build and improve upon certain theoretical systems [5.6], in order to make the system more feature rich and easy to use for both patient as well as the hospital staff by moving away from an application-based database management system to a more widely accessible web-based model.

III. Proposed Methodology

The project will be comprising of 2 main sections, together they will solve the issues discussed in the section II, the scope of the project is as follows:

A. Scope of the project

The proposed management system aims to achieve the following key objectives:

1.Information about the patient is stored at the first sign-up process for every new user, this data includes all the necessary information that is required for admission into the hospital based on government guidelines.

2. All the patient data will be made available to the applied hospital when an appointment is booked at that hospital without having to re-do the information submission manually.

3. The front-end of the project will provide the users with relevant healthcare news as well as important announcements pertaining to the current/ future pandemic.

4. The website will also provide users with the necessary contact information for various emergency services for severe cases that need immediate care and attention. The hospital will need to abide by the system and merge the two management systems as per their needs and the same can be used by the staff members for other operations in the future.

B. Front-end of the system

The website will be the main focus of the project from which users will book appointments to various hospitals, this website will be created using Wordpress and will be hosted on a custom domain, along with this various plugins will be used to make the website more interactive and easy to use from a common users perspective, the website will be accessible from the hospital LAN (local area network) for the hospital staff in order to make all the necessary modifications to patient details, registration of new doctors/ staff as well as keep tabs on various aspects of the hospital. For use within a single hospital network a custom domain will not be necessary as the data can be stored locally if the hospital wishes to do so which would bring down the cost of the overall system on a monthly basis, the website will aim to provide the following features:

1. Appointment booking: Users will be able to register appointments to any hospital that partners with us.
2. Data storage: Users will be able to safely store all their health care related information in our database for fast retrieval.
3. News and updates: The front page will provide relevant updates about the current pandemic and general updates in the healthcare sector.
4. Blogs: Users will be able to read blogs and articles about various related advances in biotechnology and healthcare.

Along with these modules other modules will be added in the near future to make the website as feature rich as possible while still keeping it easy to use for all users.

C. Back-end of the system

The back end of the proposed system will only be accessible for the developers and the admins of the project, the mainstream users will not be able to see or access this. It will contain the various databases and programs/driver codes required to keep the website running, this includes the databases of the patient, hospitals, admins as well as the doctors if the partnering hospital chooses to do so, everything will be stored in separate databases for fast retrieval and simple management of large amounts of data when scaling to a larger data set. This database will be made using MySQL and will be administered using phpMyAdmin for simplicity, MySQL is the preferred database language being used because it is one of the most basic and easy to use database services available with the following features that will be beneficial to the overall development of the project:

1. Written in C and C++.
2. It works with a multitude of compilers making it more compatible with preexisting workstations.
3. Works on many different platforms.
4. Uses multi-layered server design with independent modules that can protect other modules if one fails.
5. MySQL uses a privilege and password system which enables certain security features that are very useful for this use case, doctors can have a higher privilege level and can access more confidential data.
6. MySQL is supports larger sets of databases compared to others, it can support up to 50,000,000 records which is more than enough for a hospital DBMS.
7. Support for up to 64 indexes per table making searching and retrieving data much faster.

The initial system would include all the major databases that would be include at the beginning with more planned to be added further down the line as per the scalability demands of the project.

The various attributes of the tables will each contain one primary key along with various candidate keys if needed, the primary key in the hospital table would be the Hos-id as it would be unique to each hospital, for every patient the Pat-id would be the unique key for identification in the Patient table along with Record-id and Doc-id for medical records and doctor table respectively, these keys would be considered as foreign keys by the non-native tables and can be used to link two or more tables together.

The proposed ER diagram can be seen in Fig.1 in order to understand the relation between the different tables in the HMS database.

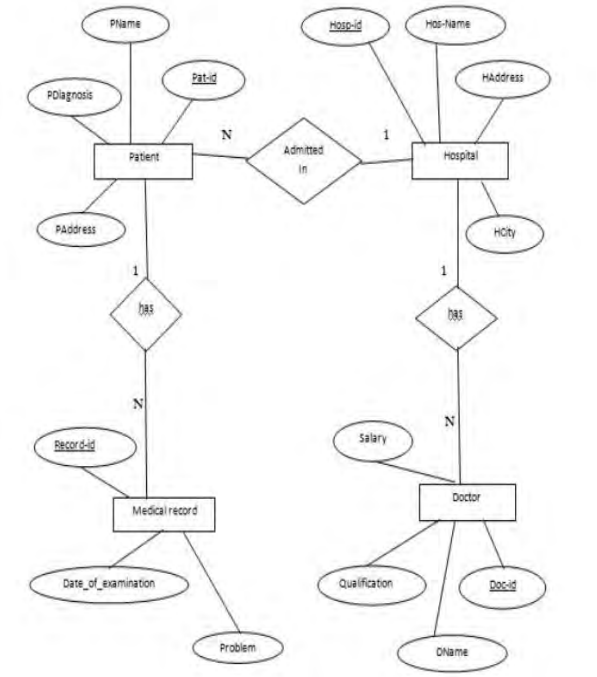


Fig. 1. Entity Relationship (ER) Diagram of the database

IV. Data Flow Diagram

The various tables in the database will be related as per the ER diagram show in Fig. 1, Along with that the basic data flow inside the database from an external point of view taking the various personnel that would be accessing this system (Admin, doctor, receptionist/nurses, patients) is shown below:

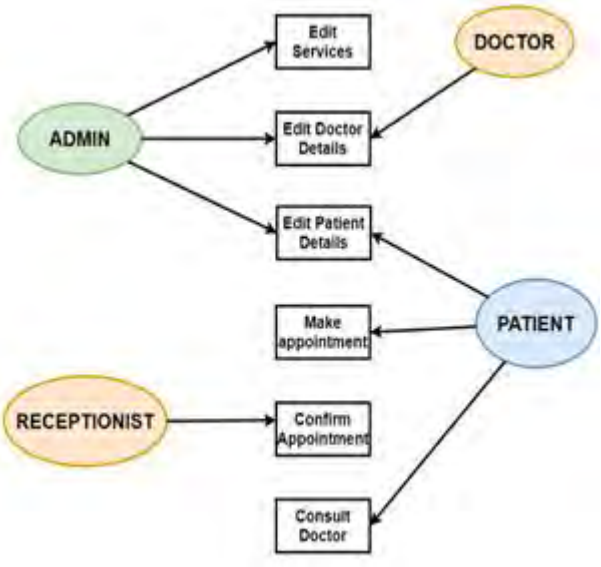


Fig.2 Data flow diagram of the project

As seen in Fig.2 the various data that is confidential about the patient will only be accessible to the patient and the doctor that is assigned to him/her, while the receptionist can only look after the various appointments that are being requested by the patient. The admin of the project will have access to the editing of all details but is only to be used if the hospital is having troubling editing the details or when the system is having technical issues related to login and data access in order to maintain confidentiality and data security..

V. Results

During the testing phase the proposed system was tested against a cloud-oriented hospital management system and the following results were obtained.

A. Comparision of proposed system with the current systems

The proposed system was compared with a generic hospital database management system and it was observed that the current system requires much more steps in order to reach the desired action as compared to the proposed system, the test was done for 5 basic tasks that a hospital performs in a day such as patient registration, patient appointment, doctor notification broadcasting, operational report generation and the diagnosis reports for the patient. The results can be observed in Table 1.

TABLE I. NUMBER OF CLICKS TAKEN

Tasks	Proposed system	Current system
Patient Registration	2 clicks	8 clicks
Patient Appointment	2 clicks	6 clicks
Doctor notification broadcasting	3 clicks	10 clicks
Hospital operational report generation	2 clicks	8 clicks
Diagnosis reports	3 clicks	6 clicks

By reducing the number of clicks, the overall time taken throughout the day adds up and is significantly reduced, there are certain tasks that require more time/clicks to access, these actions include removal of a doctor from the hospital, invoice and prescription generation to name a few, these tasks are not as time sensitive as the ones tested during simulation since these actions are performed after a patient has been treated and/or discharged and hence were left as it is during current development.

B. Efficiency comparision between systems

The comparisons were made using an online cloud bases hospital management solution that is used by multiple hospitals and is made by Sara Technologies, it was not feasible to research multiple hospitals in person keeping health safety in mind. It was observed that on average the proposed system was about 66% more efficient in comparison to the current system and the efficiency increase can be observed in Table II.

TABLE II. EFFICIENCY COMPARISION

Tasks	% increase in efficiency of proposed system
Patient Registration	75%
Patient Appointment	67.7%
Doctor notification broadcasting	60%
Hospital operational report generation	75%
Diagnosis reports	50%
Average	65.5%

VI. Conclusion

Considering all the drawbacks of the existing database management systems being used across a multitude of hospitals, this proposed system provides all the important features necessary to perform day to day hospital tasks such as patient data entry, doctor entry, patient assignment, news and hospital notices in 2-3 clicks making the system more efficient up to almost 66%,making the overall experience more streamlined since the time saved over a whole day adds up significantly, this was greatly made possible by the use of WordPress and various plugins within in ,by maintaining all the required data locally for faster access without being dependent on a fast internet connection for the same makes the system more reliable as well.

VII. Future Scope

The proposed system deals mostly with the most crucial aspects of a database management system of a hospital, a lot of features can be implemented within this project to make it more secure such as biometric authentication for doctor/staff entry, implementation of open-sourced APIs to make integrating the system with other apps such as google news for much more reliable news updates and smart AI features such as a symptom checker that users can use to self-assess themselves whenever needed without having to visit a hospital/clinic.

References

[1] Olusanya Olamide, Elegbede Adedayo and Ogunseye Abiodun "Design and Implementation of Hospital Management System Using Java," IOSR Journal of Mobile Computing & Application (IOSR-JMCA), Volume 2, Issue 1. (Mar. - Apr. 2015), PP 32-36

[2] Opeyemi Abisoye, Abisoye Blessing and Blessing Ele Ojonuba "An Online Outpatient Database System: A Case Study of General Hospital, Minna," Intelligent Information Management, 2016, 8, 103-114

[3] K.K. Bharath, Ankit Kumar, Adithya Varma and R. Rajyashree "Secured Electronic Hospital Database Management System," International Journal of Recent Technology and Engineering (IJRTE) , Volume-8, Issue-1S4, June 2019

[4] Bitrus Joseph, Wadzani A.Gadzama, Ngubdo Maigana A. and Agu E. O " Design and Implementation of a Secured Web based Medical Record Management System," International Journal of Computer Applications (0975 – 8887) Volume 177 – No. 41, March 2020

[5] KumaranS , Dr Pusphagaran, KalaiSelvi , Christopher and Deepak "A Study of Advanced Hospital Managaement System," IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), Volume 16, Issue 2 Ver. III (February. 2017), PP 127-134

[6] Adebisi O.A, Oladosu D.A, Busari O.A and Oyewola Y.V "Design and Implementation of Hospital Management System," International Journal of Engineering and Innovative Technology (IJEIT) Volume 5, Issue 1, July 2015

Engineering Government Jobs

Shreya Mishra
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
s1032190568@gmail.com

Kunal Miskin
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
kmiskin311@gmail.com

Vikas Mishra
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
vikasmishra8828@gmail.com

***Abstract* — 'Engineering Government Jobs' project is a web application developed on Java technology, JSP and Apache Tomcat. The web application provides any person from engineering background a systematic tool and comprehensive solution to browse across various Government Jobs available from among various job domains such as civil services, engineering specific, research, defense and banking. Also, its provides a unique filtering feature that can provide personalized eligibility result based on the input taken in via an eligibility form. The project aims to provide a user-friendly web solution for easy and effortless experience. The Engineering Government Jobs project delivers quick and reliable results for the list of exams the user is eligible for, based on the eligibility form filled by the user. The exam pages are designed to provide detailed and precisely correct information about a particular exam complied together from authentic sources.**

Keywords— Web Application, JDK, Eclipse, JavaScript, Tomcat, Bootstrap.

I. INTRODUCTION

Employment is the one of the essential needs of this century. Job security and job satisfaction follow by closely. Private sector offer jobs for various domains but job security there is still a major concern. Government jobs on the other hand offer great job security and also have numerous vacancies for every profile. Not many are aware of this, especially those from engineering background from urban region where mostly engineers focus on the private sectors. This project aims at creating an awareness about these government job exams.

Java is the most widely used technology to design web applications since last decade. While there is no denying that Java is efficient and powerful tool but it cannot meet the everchanging needs and requirements of modern technology. JavaScript has emerged as powerful tool that enables developers to build highly responsive web applications. Hence, it's important to develop web applications using JavaScript libraries.
Bootstrap is the most mainstream HTML, CSS, and JavaScript structure for creating responsive, portable first sites. It provides a number of features to make the web application user friendly and actually provide great UI feature. Also, it is a free and an open-source front end web system, thereby making it a handy tool for powerful web application development.

II. PROBLEM DEFINITION

After reviewing the works of already available solutions (websites) in the similar domain, the noted key points that these solutions (websites) fail to deliver were:
1.Highlighting post qualification perks – Most of the websites did not provide the list of post qualification perks that the qualified candidate enjoys.
2.Adequate pay scale information – There are not authentic and adequate pay scale information available for considerable number of Government Jobs. most of the sites fail to provide the adequate pay-scale information.
3. Statistics – The sites also failed to highlights major statistics about the exams.
4. Customized results – None of the solution currently available have a feature to generate customized eligibility result.
Thus, this project aims to deliver the above mentioned key features in the web application along with the usual elements present in the solutions already available.

III. MOTIVATION

The pre-existing websites of various sports club are static in nature. The 'Engineering Government Jobs' projects aims for creating an awareness about the Government Jobs thereby yielding government jobs. As an engineering students, the motivations drops from the search of potential employment sector with scope of job security.
The Engineering Government Jobs project aims at:
1. Creating an awareness about Government Jobs thereby yielding government jobs.
2. Providing customized results.
3. Suggest study material and road-map in order to achieve Goals.

Further its also aim to practically apply the technical learnings inculcated in the ESD program where topics such as Java programming language, Dynamic web projects in eclipse, Apache Tomcat, Html, Css and likewise topics.

IV. LITERATURE SURVEY

This project aims to work in the domains of providing information regarding Government Jobs yielding government jobs. This domain has quiet a few existing solutions in form of various websites. Thus, a sincere literature survey was done to understand the solutions that are currently available, what features are already

covered by the existing websites, thereby figuring out the feature missed by them and subsequently proposing a better system.

Nahar Wildan in his paper title 'Dynamic view Rendering using JavaScript' has written that while HTML and CSS are adequate tool to create front end of a website, but modern days websites and applications require powerful tools like Java Script and other JS libraries.

Y. Durganath and P. Edreena in their Paper titled – 'Role Of Bootstrap In Web Page Creation' emphasized on advantages of Bootstrap for creating responsive, portable first sites. Bootstrap is an open-source front-end web system for planning sites and web applications. They wrote that Developers can adjust the Bootstrap doc itself, selected parts that they wish to use in their task.

V. PROPOSED DESIGN

Engineering Government Jobs web application is divided into two major modules, viz. Browsing option and Eligibility Check. Both the two modules provide different functions that can be used by the user.

Whenever the user opens the web application, user is provided with two options on the home page, either he/she can directly know what all exams he/she is eligible to appear for by filling an eligibility form or he/she can browse from among various exams perfectly categorized into sub-domains for better experience.
'Know your Eligibility' button redirects the user to a new page that is nothing but the eligibility form. After submitting the filled form, a eligibility result page opens up with customized lists of exams which the user is eligible to apply for. Clicking on a particular exam button open that particular exam page containing detailed information about that exam. If the user chooses to manually browse for the exams, he can do so in the 'Select your exam' section. As explained earlier, this section provides user to browse from among various exams perfectly categorized into sub-domains for better experience.

The coding was done in Eclipse IDE (Java EE module) in order to design and implement the project. Eclipse provides powerful functionalities to create dynamic web projects. The project was divided into three components – Views and a Controllers and Algorithm. The views were created using JSP (Java Servlet Page), HTML and CSS. Each page was created separately and then linked to each other using Controllers. These interfaces were designed to provide the 'view' in the front end. Bootstrap framework was used in order to provide an enhanced and a user-friendly experience.

The web application uses Java classes to turn the static JSP, HTML pages into dynamic web application. These classes are called Controllers. The java classes were written also written on the JSP page as JSP-java servlet pages provide a feature to write the java codes as well as the Html and Css formatting on the same platform. These Java classes provided the method to design flow of process and data in our web application. The Controllers controlled the Search results according to the filtering algorithm. The details entered in the eligibility form were transferred to another page by using POST method to prevent the information leak. Each and every pages are linked precisely to form a continuous flow.

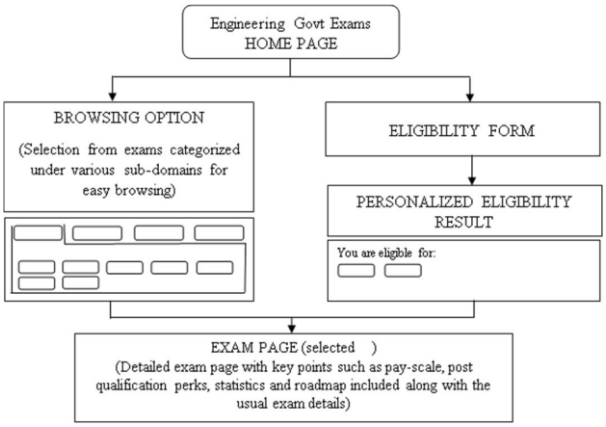


Figure 1. Data flow diagram

VI. RESULT & DISCUSSIONS

This project is aimed at developing a web application for engineering crowd for creating awareness about this employment sector. The entire flow of the web applications is designed for creating a user-friendly environment.
The first page is the Home page consisting of About section and Exams sections.

Fig 1.1. Home Page

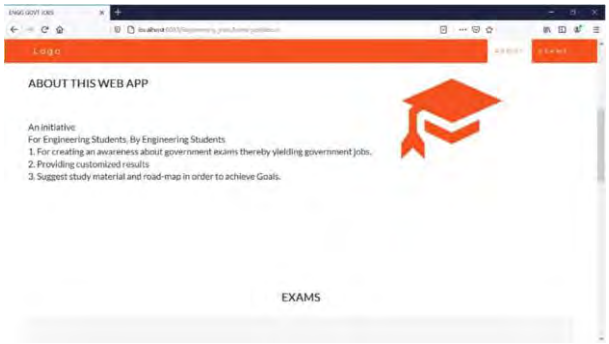


Fig 1.2. About Section

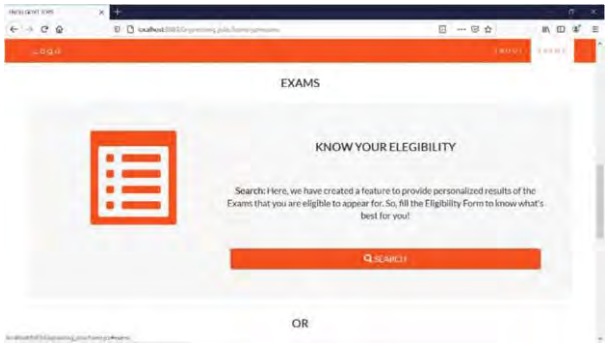


Fig 1.3.a. Exams Section- Know Your Eligibility

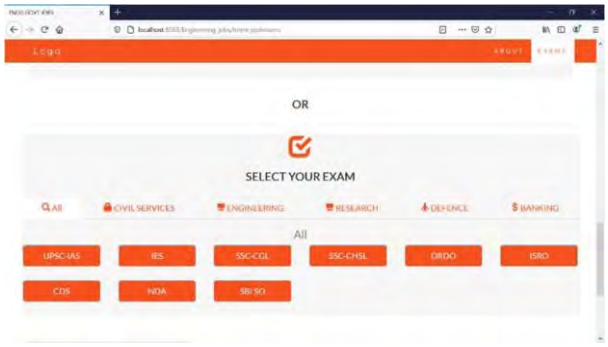


Fig 1.3.b. Exams Section- Select Your Exam

The Exam section divided in two sub-sections, namely, Eligibility Check option and browsing option (as shown in fig 1.3.a. and 1.3.b.). Upon Clicking the Eligibility search button, the user is redirected to the eligibility form section. Fig 2.1 shows the eligibility form page and Fig 2.2 shows the eligibility form.

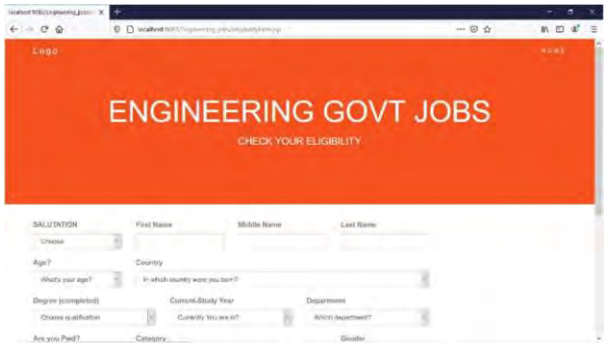


Fig 2.1. Eligibility Form Page

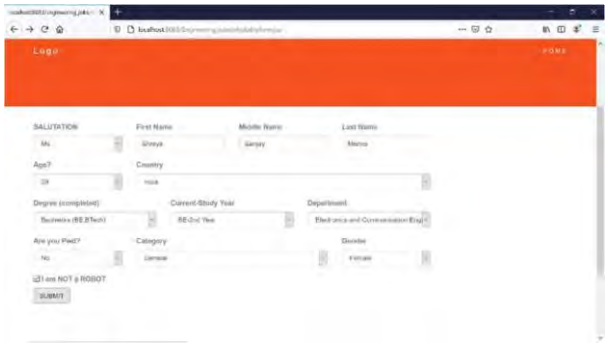


Fig 2.2. Eligibility Form

Upon successfully filling the form and thereby clicking the submit button, user is redirected to the Result page that has the Filtered list of exams as per the user information precisely coded to deliver accurate eligibility result. Fig 3.1 and 3.2 shows the Personalized eligibility result page.

Fig 3.1. Personalized Result page

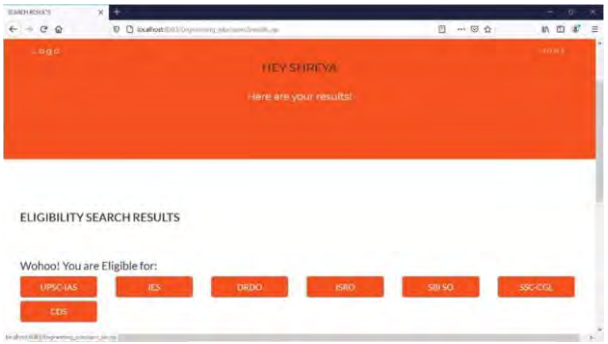


Fig 3.2. Personalized filtered result

As visible in Fig 3.2, personalized eligibility exam list is provided. Accordingly, as the user click any exam button, say, Upsc-IAS button is clicked, this redirects the user to the IAS exam information page. This can be seen in Fig 4.1.

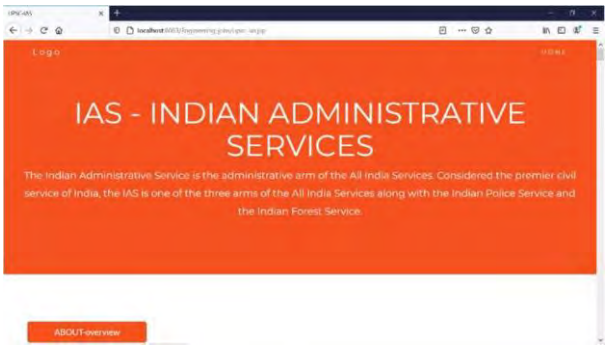


Fig 4.1. IAS exam page

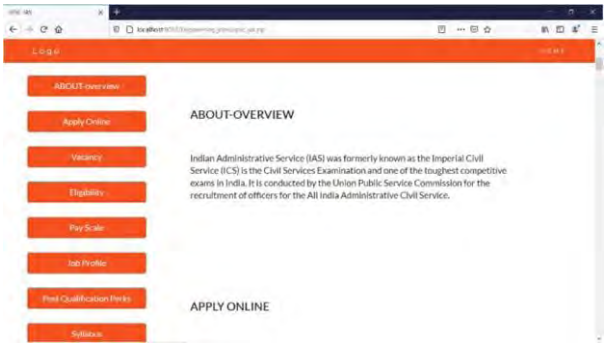


Fig 4.2. Side navigation

As visible in Fig 4.2, A handy side navigation bar is provided to provide easy browsing option. The user can navigate to any section he/she is interested in quick seconds.

The exam page covered every key points that were missing in the already existing web application. Fig 4.3 shows the Pay-Scale section where a detailed pay-Scale information was provided.

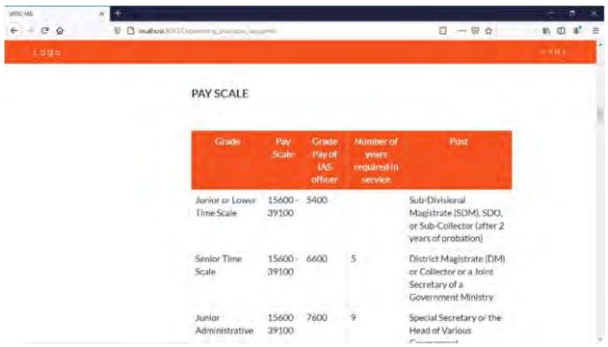


Fig 4.3. Detailed Pay-scale information

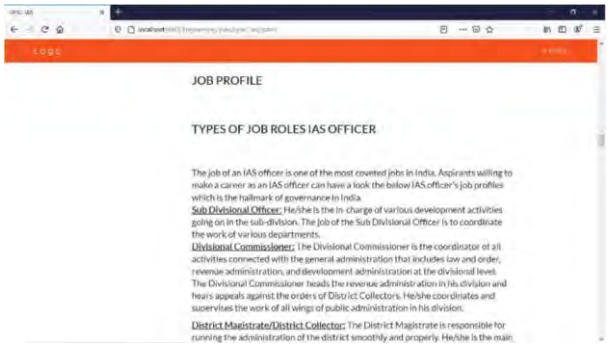


Fig 4.4. Job profile information

Fig 4.4 shows the Job-Profile section where a detailed information about the Job was provided.

Fig 4.5 shows the Post Qualification Perks section where a detailed information about the Perks that a qualified candidate enjoys was provided.

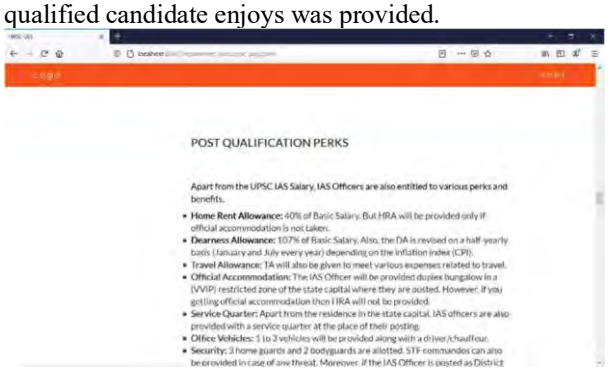


Fig 4.5. Post Qualification Perks Section

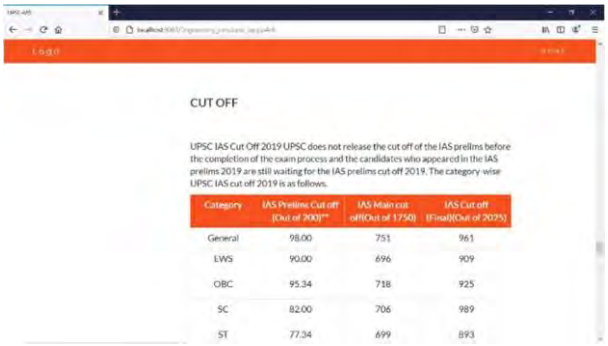


Fig 4.6. Precise Statistics

Fig 4.6 shows the Precise Statics section where a detailed previous year statistic about exam was provided. Fig 4.7. shows Preparation tips (4.7.a.) and Reference books (4.7.b.), Thereby, providing Roadmap and Study material details.

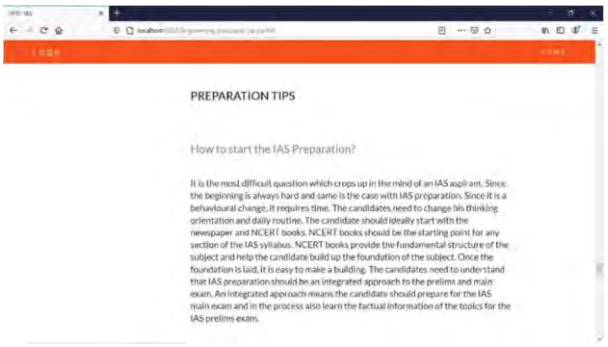


Fig 4.7.a. Tips for preparation

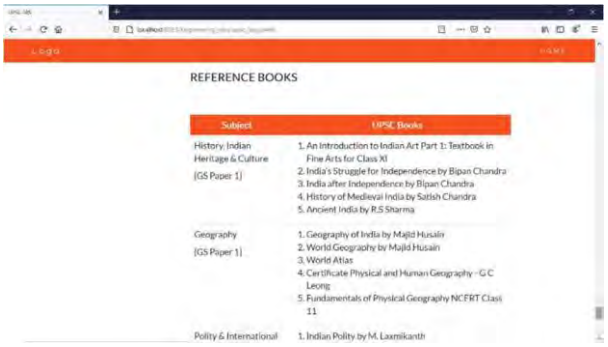


Fig 4.7.b. Study Material information

If the user chooses to manually browse for the exams, he can do so in the 'Select your exam' section. Where the user can browse from among various exams perfectly categorized into sub-domains for better experience. Fig 5.1. Shows the Categorized sub sections.

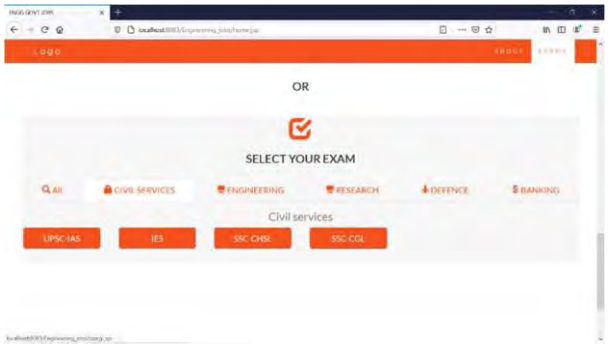


Fig 5.1. Select Your Exam Section

Accordingly, if the user selects any particular exam, that particular exam page opens up. Here, in Fig 5.2. SSC-CGL page if opened as the user clicks on the SSC-CGL button.

Fig 5.2. Selected exam page

VII. SCOPE OF PROJECT

This project will have a direct influence and will prove to be very advantageous for:
i) Engineering students of who aspire to acquire a Government job.
ii) People from engineering background looking for employment.

The Engineering Government Jobs project can further be enhanced by involving features such as:
1) Sign in / Profile
2) Adding more exam domains
3) Contact us/ Comment

VIII. CONCLUSION

This project was successfully implemented with all the features mentioned the system specifications. This project was an initiative for Engineering Students, by Engineering Students

- For creating an awareness about Government Jobs thereby yielding government jobs.
- Providing customized results
- Suggest study material and road-map in order to achieve Goals.

So, this serves the right purpose in achieving the desired requirements of the community. The 'Engineering
Government Jobs' incorporates Bootstrap styling framework. The Model layer was based on the front end which contained Views designed using JSP and CSS. The Controller has servlets stored in it and used HTTP Session Request and POST method.
The dynamic web application was tested on Apache Tomcat server. The web application was able to precisely deliver the filtering eligibility search results with the help of filtering algorithm thereby providing a unique feature.

REFERENCES

[1] Durganath, Y. & Edreena, P.. (2016). Role of bootstrap in web page creation. International Journal of Pharmacy and Technology. 8. 21116-21122.
[II] Nahar, Wildan. (2016). Dynamic View Rendering Using ReactJS and jQuery. https://www.researchgate.net/publication/307144603_Dynamic_View_Rendering_Using_ReactJS_and_jQuery/citation/download

This page is kept blank intentionally

Ayurveda For You and Me

Sheetal Suresh Chaudhary
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
chaudharysheetal695@gmail.com

Shravani Deshmukh
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
shravanideshmukh18@gmail.com

Neha Gupta
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
neha30gupta10@gmail.com

***Abstract* — 'Ayurveda for you and me' is web application developed on various software and using various coding languages. Apache Tomcat was also adopted which is open source web server developed by the Apache Software Foundation. Since, Ayurveda is one of the oldest medical systems, it comprises thousands of medical concepts and hypothesis. Interestingly, Ayurvedic medicalization has ability to treat many chronic diseases such as cancer, diabetes, arthritis, and asthma, which are untreatable in modern medicine. Unfortunately, due to lack of scientific validation in various concepts, this precious gift from our ancestors is trailing. This website is to make people aware about Ayurveda. Solutions for many modern problems will be included in this website. It is developed by using Visual studio code software, used HTML, CSS, Bootstrap as the prime coding language for the front end and JavaScript is prime language used for the backend. Type the problem get the solution i.e., this would be user friendly , personalized and customized website. This small attempt for the development and promotion of Ayurveda.**

Keywords— Database, Bootstrap, CSS, JavaScript, HTML, Visual studio code , UI, medicalization

I. INTRODUCTION

In today's times, its very crucial to have right knowledge of everything including one's health, right precautions, symptoms, treatments, cures ,doctors and right centers where they can consult right people for their health issues. As of in the current COVID pandemic, people have taken a U-Turn and got inclined to the very traditional Indian roots, the Indian science of healing i.e. AYURVEDA.

Java is used to create dynamic websites. Java provides support for web application through Servlets and JSPs. There is no denying the enhanced capabilities of Java but JavaScript has emerged as a new modern tool for delivering powerful web app. JavaScript has emerged as powerful tool that enables developers to build highly responsive web applications. Hence, it's important to develop web applications using JavaScript libraries.
Considering this, Bootstrap is the most-easy HTML, CSS, and JavaScript structure for creating responsive, sites. There are tons of features to make the web application user friendly. To add to this, it is a free and an open-source web system, thereby making it a go-to tool for creating a balanced web application development. While there is no denying that Java is efficient and powerful tool The major coding language used in the project was HTML and CSS. Using CSS modularizes the websites . The front end was designed using visual studio code Software. Visual Studio Code combines the simplicity of a source code editor with powerful developer tooling. First and foremost, it is an editor that gets out of your way. The delightfully frictionless edit-build-debug cycle means less time fiddling with your environment, and more time executing on your ideas. Visual Studio Code supports macOS, Linux, and Windows - so can hit the ground running, no matter the platform

II. PROBLEM DEFINITION

People lack knowledge about Ayurveda. Currently, there is a huge demand for natural ways and methods to keep oneself healthy and find natural cures which proves beneficial in longer run , gradually many are turning towards the traditional Indian science , 'AYURVEDA'. The pre-existing websites of Ayurveda do not have the entire information altogether at a one place. The user need to scroll on different websites to get the needful information. This project have made it really easy for the user to get more than the entire thing all at one place i.e various provide more transparency while simultaneously generate revenues for them.

III. MOTIVATION

Allopathy was recently introduced in India and practiced across the world. Allopathy is commonly used for modern science. It is a method of treating a disease that can produce different effects from the disease. There is a development of certain drugs that help to cure diseases. By pharmaceutical industries, there was a discovery of antibiotics that can cure the disease quickly and provide rapid relief in the pain but with side effects. There are several reasons to choose Ayurveda over Allopathy.

The shift towards medicalization should be increasingly seen to be influencing traditional life sciences like Ayurveda. The motivation of the project ' Ayurveda for you and me' was to motivate people about adopting Ayurveda .

IV. LITERATURE SURVEY

This project aims to work in the domains of providing information regarding Ayurveda. This domain has quiet a few existing solutions in form of various websites. Thus, a sincere literature survey was done to understand the solutions that are currently available, what features are already covered by the existing

websites, thereby figuring out the feature missed by the other Ayurvedic websites subsequently proposing a better system.

Nahar Wildan in his paper title 'Dynamic view Rendering using JavaScript' has written that while HTML and CSS are adequate tool to create front end of a website, but modern days websites and applications require powerful tools like Java Script and other JS libraries. Y. Durganath and P. Edreena in their Paper titled – 'Role Of Bootstrap In Web Page Creation' emphasized on advantages of Bootstrap for creating responsive, portable first sites. Bootstrap is an open-source front-end web system for planning sites and web applications. They wrote that Developers can adjust the Bootstrap doc itself, selected parts that they wish to use in their task.

The contents which appear in the website was taken from different renowned papers and by going through various concise and precise website . Comparison between different websites was also made to deliver precise information to the people .The paper titled 'Ayurvedic treatments for diabetes mellitus' by authors Kalpana Sridhar, Roshni Mohan, [...], and Deepak Panneerselvam successfully gave the Ayurvedic path to the people suffering from diabetes, which can also be imprinted in the website.

Gopal Basisht in his paper title 'Exploring progression of Ayurveda' has detailed about the history of Ayurveda followed by the current scenario and the future progression of Ayurveda in nurturing humanity and enhancing the life on earth.

Bhupendra Koul in his paper title 'Role of Ayurveda in Cancer Treatment' has emphasized about the incredible capabilities of Ayurveda in the field of Cancer Treatment.

V. PROPOSED DESIGN

Ayurveda for you and me web application is divided into two major modules, viz. Browsing option and Searching option(not available for now). Both the two modules provide different functions that can be used by the user.

Whenever the user opens the web application, home page will appear. In the about section, when he/ she scrolls down, Ayurvedic treatment, precautions, cure of various diseases are mentioned. This diseases do not have proper allopathic treatment, once the user click on image he/ she will be directed through the details of the same. In the search bar, the user can select the type of health issue from the drop down list (designed using bootstrap)and then he/ she will be directed for cure of the same.

There is a tour section following about section which takes the users to the real tour of their kitchen which will make them remind of the phrase "The one who was searched every street found inside the house only". Then there is a Contact section where he/ she can raise their queries (Any- if have) in the comment box, which will be answered by the admin in a while. The user can also contact using mail ID / phone no. provided for any sort of help. The navigation bar contains the more section, which includes major two things:

I) Details of some best Ayurvedic hospitals

II) Future scope of Ayurveda

Click on them and you will be redirected to the detailed page.

The last thing included in the website is map,click on it and know the Ayurvedic centres near you. As the number of users increase, the amount of data to be stored, processed and update will increase tremendously with time.

The major objectives involved in project planning are listed as follows -

i.To create a website that meets the expectations of the population getting inclined towards Ayurveda.

ii.To create a website providing easy and accurate ayurvedic solutions to daily health issues, centers, future opportunities etc. all at one place.

iii.To promote the ancient healing technique, Ayurveda.

Figure 1. Data flow diagram

VI. RESULT & DISCUSSIONS

Figure 2. Home Page

The front end of the web application was successfully completed on Visual Studio code using HTML, CSS Bootstrap and JavaScript at some places. It consists of a navigation bar that has five basic options –Home, About, Tour, Contact, More .The navigation bar is developed using bootstrap.

The Home Page shown in figure 2, is the default page of the website.

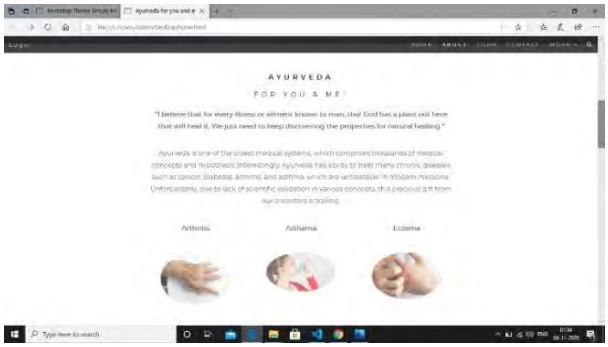


Figure 2.1.About Section

The 'About' section contains various diseases which have only Ayurvedic treatment. Click on it for more details

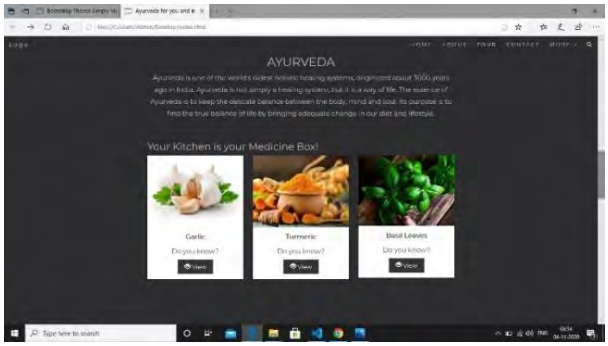


Figure 2.2. Tour Section Take you to the tour of your Kitchen. (Okay! You clicked on turmeric)

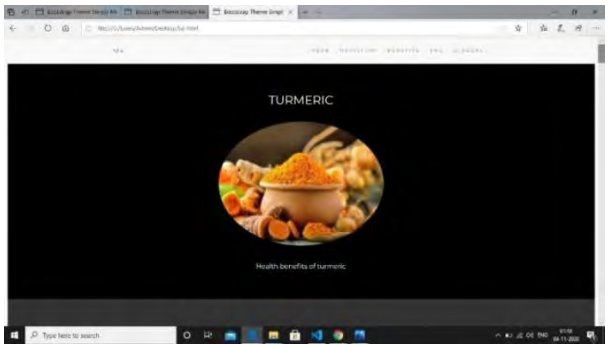


Figure 3.Turmeric(On another page)

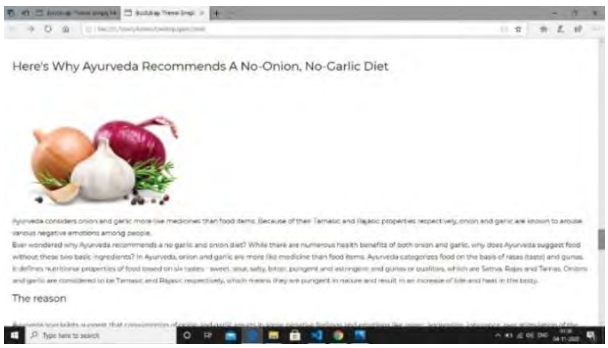


Figure 4. Garlic section

Each section contains almost all the information about the given herb in a user-friendly way with frequently asked questions and their answers .

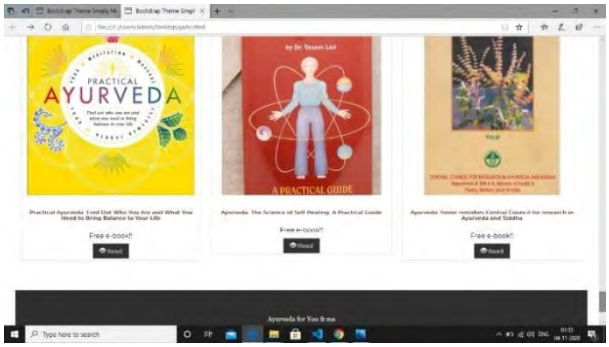


Figure 5. Free Ayurvedic e-books

Free e-books for Ayurveda are available for knowing the roots and wings of Ayurveda. The book is in the pdf format and the user can download it too.

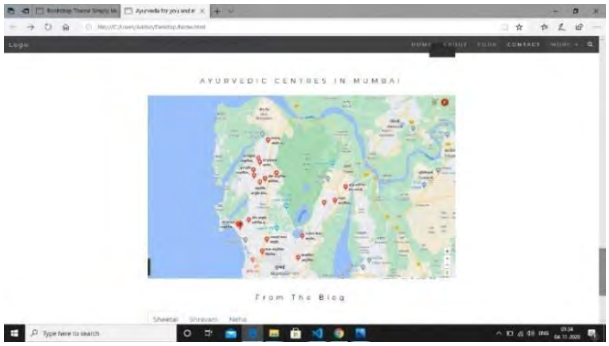


Figure 6. Maps

Maps for knowing the location of your nearest Ayurvedic Centre.

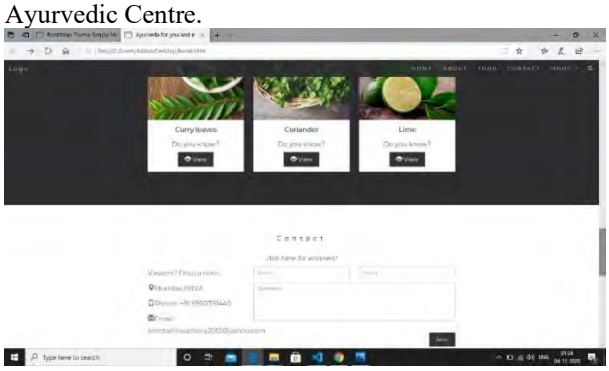
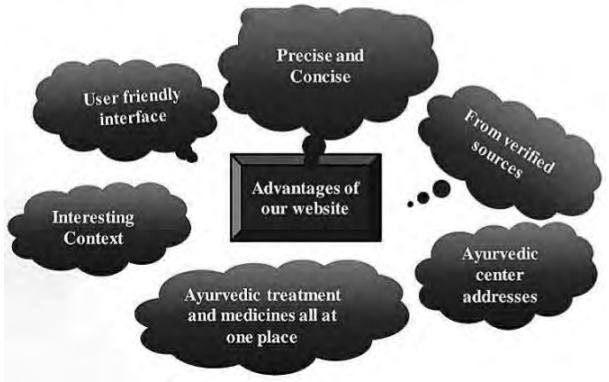


Figure 7.Contact Us section

Advantages of the project:



User-friendly Interface

- Precise and Concise

- Contains information from the verified sources
- Ayurvedic treatment and medicines all at one place
- Interesting and amazing context Contains the information , contact details, address of the Ayurvedic centers.
- Personalized Solutions

VII. SCOPE OF PROJECT

Owing to rising popularity and realization of benefits coming from natural elements in Ayurvedic medical systems, there is ample scope for BAMS students in future in both India as well as developed countries like US and UK.

Teaching field is also open for BAMS graduates in India and foreign countries where the young generation can have detailed knowledge about Ayurveda which in turn they can use for helping people and serving country.
Thus, more and more people in the country will feel a need of a website on Ayuveda of such type. Hence, this project has a great scope in longer run.

The project can further be enhanced by involving features such as:

1) Sign in / Profile
2) Personalized profile section
3) Adding more Ayurveda domains

This website needs further advancement by including advanced UI and database, which will lead to a strong Website for Ayurveda wherein the viewer will find every single information and personalized solutions required at the single place.

VIII. CONCLUSION

The front ends of the dynamic website as been successfully completed under Project Based Learning (PBL) – Semester IV.

It has been designed and developed on Visual Studio code to make it efficient and powerful. Other methods to generate notifications, delete notifications, comments and likes have also been created and deployed.
The front has been designed in such a manner that schema of database can be implemented without causing a lot of hindrance to the front end. The design has been developed in such a manner that it is minimal and efficient, hence taking care of UI/UX. Thus, this website is an attempt to promote Ayurveda and help people find the right knowledge about it as the Ayurvedic system of medicine is very safe that can help in reducing the enormous burden of mortality and morbidity caused by the various side effects of conventional prescribed drugs.

The user of this website will be able to find the various ayurvedic cures, treatment, medicines, centers for their various health related issues. is a user friendly website with a user friendly interface. Most of the queries of the clients will get answered at a single place once they reach out to our website.

REFERENCES

[1] Manohar PR, Eranezhath SS, Mahapatra A, Manohar SR. DHARA: Digital helpline for Ayurveda research articles. J Ayurveda Integr Med. 2012;3:97–101. [PMC free article] [PubMed] [Google Scholar]
[2] Shekelle PG, Hardy M, Morton SC, Coulter I, Venuturupalli S, Favreau J, et al. Are Ayurvedic herbs for diabetes effective? J Fam Pract. 2005;54:876–86. [PubMed] [Google Scholar]
[3] Datta HS, Mitra SK, Patwardhan B. Wound healing activity of topical application forms based on Ayurveda. Evid Based Complement Alternat Med 2011.2011:134378. [PMC free article] [PubMed] [Google Scholar]
[4] Basisht G. Exploring progression of Ayurveda. Ayu. 2011;32:445–7. [PMC free article] [PubMed] [Google Scholar]
[5] Dwivedi V, Anandan EM, Mony RS,Muraleedharan TS, Valiathan MS, Mutsuddi M, et al. In vivo effects of traditional Ayurvedic formulations in Drosophila melanogaster model relate with therapeutic applications. PLoS One.2012;7:e37113. [PMC free article] [PubMed] [Google Scholar.

Autonomous Drone for Social Distancing Surveillance

Sujay Kadam
Department of Information Technology,
SIES Graduate School of Technology,
Navi Mumbai, India

Geeta Seshapalli
Department of Information Technology,
SIES Graduate School of Technology,
Navi Mumbai, India

Abhilash Nayak
Department of Information Technology,
SIES Graduate School of Technology,
Navi Mumbai, India

Bushra A. Shaikh
Department of Information Technology,
SIES Graduate School of Technology,
Navi Mumbai, India

***Abstract* — Drones being capable of doing things that are not even remotely possible for a human have a major role to play in our society. These unmanned aerial vehicles have endless applications in various fields such as photography, surveillance, farming and communication systems. These drones due to such extraordinary capabilities pose a serious threat to privacy of the general population. However in desperate situations privacy is overtaken by safety and security in terms of priority. In this project the application of unmanned aerial vehicles in the surveillance field are explored while walking the thin line between invasion of privacy and safety concerns. An autonomous drone with a camera module with an intelligent scene analysis model is used to automate the surveillance of vast areas in a single go while keeping maintenance cheap and operability easy. The primary focus would be to surveil the overall population for honouring the "social distancing protocols" and then based on the results, a tool with a wider application in human behaviour analysis is to be developed.**

I. INTRODUCTION

COVID-19, the global pandemic which has led to more than 2.2 million deaths and has infected more than 103 million people worldwide, makes us re-analyse how national governments, organizations and people around the globe can co-exist with minimal or without physical interaction. These kinds of situations call for interception of various authorities, ultimately increasing the risk of spreading the virus i.e. by sending officials to analyse the situation. In some emergency situations this might not be possible (places of protest, mob gathering, crowds at shops etc.) In these situations a portable and inexpensive solution is required to help maintain social distancing norms. This is where a fully autonomous drone with video transmission capabilities is required. Solutions available in the market are not inexpensive and are not modular at all. Hence there is a need for a cheaper solution with necessary features for crowd surveillance which can detect problems quickly and efficiently. Advancement can be induced by engaging a synchronized and a distributed system of easy to use Drones specialized to detect people and analyse the conditions of social distancing norms in the affected area.

Using a wide range of sensors, we can bring efficiency to this process increasing detection accuracy significantly with digital processing and GPS back-up. These Drones are compact, consume low power and easy to use. These Drones are a moderate one-time investment and are meant to last for years.

II. NEED OF PROJECT

An important field of concern for government and organizations across the globe in current scenario is to prevent the spread of the virus, strict rules regarding social distancing are called for to reduce the need for physical contact. Most countries shut down non-essential public places, banned mass gatherings and placed a social distancing protocol to limit physical contact. Alternative is to develop a portable alternative to the manned aerial vehicle model with the ability to move autonomously through an unhindered landscape. To provide a cheap and flexible alternative compared to humans who are prone to the virus. Reduce human error using sophisticated artificial intelligence models and computer vision algorithms. Equip drone with HD Camera, RFI Antenna to perform diagnostic surveys of topology. Perform autonomous flight using maps of the system.

III. LITERATURE REVIEW

The presented system helps to detect the affected area. A GPS module interacts with Server-side software and provides real-time location as well as receives the destination location. Yuan Yuan [1], proposed Scene Recognition by (MRDLA) Manifold Regularized Deep Learning Architecture, which is an improved multilayer learning model, which only lets the model to built single-layer learning structure. The algorithm is modified in such a way that it utilizes graphical structure of the data by moving it to the kernel space for deep architecture. It predicts next hidden space layers and imports previous layer's results to define a basic unit that is used further. In every unit, a commensurately weighted graph can be effectively learned in the manifold kernel space. This space layer is placed to retain the knowledge structure which improves embedding. Use of low-dimensional, non-linear structures helps to create a single layer at a time deep learning architecture is efficient. Scene analysis by categorizing images of into different classes is a vital problem that is crucial in the field of computer vision and deep learning. It is essential to minimise the difference between computers and humans where understanding of the scene is very much important for a application. Ali Al-Naji [2] on Life Signs Detector

Using a Drone in Disaster Zones describes the after-effects of a calamity, such as earth tremor, outpouring, or snow slide, base scan for victims is usually hindered by rocky surfaces and rugged terrain. The prime motto of this review was to probe the usefulness of a drone prepared for living beings detection with a entirely exceptional computer vision framework. The suggested idea uses image clips acquired by a drone surveillance from a distant to detect the respiratory action caused by the timely bust motion of victims. The outcome of this testing of humans and one dummy in several positions indicate that movement sensing on the body surface of the victims is possibly going to be advantageous to find vital signs without any intimate reach.The conclusions put forward during this research may cause a stand-in manner to living creature identification and distant bodily sensing valuation of victims. Yo-Ping Huang [3] explained the idea of scene detection using an autonomous drone. In this, the drone captures high-resolution images, records videos, and provides live streaming of the base using a 14 mega pixels camera lens. Since the camera is capable of capturing and recording good quality images and videos, image processing, landmark detection, and scene recognition becomes easy. For a detailed analysis of that area histogram and machine learning algorithms like linear support vector machine are used. In this method, it inspects each frame of the video captured by the camera sensor, detects the object, and with the help of the detection results it triggers the required commands and actions to the drone. Also, the drone is well equipped with collision detecting sensors, it eliminates all complexities and capable of flying autonomously.

Arne Devos et al. in [4] proposed a method of operating and development of autonomous drones in real time using LiDAR-based obstacle avoidance drone systems. Along with its functionality of moving drones autonomously, they ensured the avoidance of obstacles in a complex environment. This paper is sectioned into two parts. In this methodology, 2 LiDAR sensors are placed on the front side of the drone.

Whenever the drone detects any object within a distance of 20cm it produces raw sensory signals which are mapped into 2 parameters 1 and -1, here -1 denotes a condition where no obstacle is detected within a given range and 1 denotes there is an obstacle within a specified range. This output is known as yaw value, which tells us about the obstacles which are found in the left or right direction. For instance, positive yaw value means there is an obstacle to its left so the drone steers to the right side and vice-versa. This enables the drone to navigate the complex environments. A flight controller called PIXHAWK is used as it is open source and modifiable. It is an autopilot flight stack, which is used as a vehicle controller in hardware. Also interfacing of PIXHAWK with LiDAR Sensor is not complicated in fact it makes sure the drone doesn't hit with its propellers. In paper [5] proposed by Himadri Nath Saha et al. in which designing of low cost fully autonomous GPS based Quadcopter is described. This Quadcopter is designed to be used in disaster management where rescue operators are unable to reach that affected area. Night vision is used to obtain the data of the people who are stuck in those affected areas. Since cameras are used in this system live broadcasting of that area can be obtained and necessary actions can be taken by the rescue operation. This paper, mainly focuses on regions one that is onboard communication using a live broadcasting technique with UAV management and second is the establishment of the wireless drone. Also if there is anynetwork disconnection issue, it can be solved with the help of Delay Tolerant Network using a data sorting mechanism and with the help of autonomous flight wireless nodes in which data deliveries are supported. In general DTN for the disaster system and AFW for acquiring data via wireless medium using charged batteries. In some situations there can be a very high saturation of the network, to avoid this a LTE based station can be used instead of regular network equipments. The only drawback here is, it requires a high battery voltage supply to operate this drone.

In order to overcome these problems Sunggoo Jung et.al [6] introduced the deep learning and Line of Sight (LOS) algorithm concept in this system. LOS vector is used to obtain the navigation path from the starting point to the target destination. LOS vector handles the quadrotor dynamics. In this system, the main target is to achieve the best performance in terms of navigation speed. Instead of VGG-16 which is used in SSD mode for high navigation and speed AlexNet as a base network is used. Rose bag function of the ROS is used to collect the training data where fisheye camera is mounted to capture data from quadrotor. The LOS guidance algorithm is personalised to control the drone to fly through the gate center which is captured by the proposed deep learning network. Therefore, many scenarios like rescue missions, avoiding falling debris, search and other obstacles can be detected by modifying the base algorithm.

In [7] Parabjot Singh Sandhu discusses the dynamics of a quad motorized unmanned aerial vehicle. He discusses the types of aircraft, their weight with respect to air density, and how it affects the dynamics of the drone. It is further discussed what is the axis of movements in the drone i.e. roll, pitch, yaw, and elevation. Roll and pitch being the lateral and longitudinal rotation respectively while yaw is the rotation in the plane parallel to the ground. To control each of these axis a radiocontrolled transmitter and receiver pair is used. By interpreting the PPM (pulse position modulated) signal the microcontroller controls the speed of respective motors and maneuvers the drone.

The fabrication and design process is discussed by Sandeep Khajure, Vaibhav Surwade, Vivek Badak in [8]. The drone is made using an X-Configuration i.e. the motors and frame of the drone are in an X formation, such that the arms of the drone are perpendicular to each-other and the axis of movements

are 45° leading to each of the arms with a microcontroller as the origin. It is important to configure the motors to move in opposite directions being next to each other, this means that the consecutive motors should spin in opposite directions. This ensures that the yaw axis movement is counterbalanced and the drone is stable, otherwise the drone will drift in the direction opposite to the movement of the motors. This also allows us to configure the drone to move in the yaw axis by speeding up certain motors.

Andrew Gibiansky in his publicly available paper [9] ex- plains the mathematical functions of the Proportional – Inte- gral – Derivative (PID) feedback loop with the manual input from the radio control signal to control the drone. It is evident that the energy used by the motors during a specified time period is the force generated by the propeller multiplied by the volume of the air displaced by it (P dt = F dx). This implies, the power is adequate to the thrust times the air velocity (P = F dx/dt) ie. P = T vh . We take it that speeds are low, so vh is hovering air velocity. We also take the air that surrounds the drone is still relative to the it, v∞ , is zero.

Hover velocity is given as, $v_h = \sqrt{T/\rho A}$ where ρ denotes the density of the air and A is the area of the propeller. By the gleaned equation of power, we know $P = \tau\ \omega\ K_v/K_t = T\omega\ K_vK_\tau/K_t = T^{3/2}/\sqrt{2\rho A}$. Generally, $\tau = \vec{r} \times \vec{F}$; which means that the torque is directly proportional to the generated thrust T with a constant ratio K_τ determined by alignment of propeller blades. Solution of thrust magnitude T, implies that thrust is proportional to the angular velocity of the motor squared: $T = \left(\frac{K_vK_\tau\sqrt{2\rho A}\omega}{K_t}\right)^2 = k\omega^2$ where k is a constant with appropriate dimensions. Combining all the motors, it is clear that the total thrust on the quadcopter is given by $T_B = \sum_{n=i}^{4} T_i = k \begin{bmatrix} 0 \\ 0 \\ \sum {\omega_i}^2 \end{bmatrix}$. Another major force acting on the drone is the drag caused by the wind while in motion we denote it by $F_D = \begin{bmatrix} -k_d\dot{x} \\ -k_d\dot{y} \\ -k_d\dot{z} \end{bmatrix}$. For extra precision, vectorin all the three directions is considered. Now that all the major forces acting on the frame of the drone are considered functions for controlling the motion of the drone can be designed. These functions allow us to control thrusts in all directions to perform the desired manoeuvres.

Du, Juan. in their paper [10] discuss algorithms used in recent times for object detection. These algorithms include CNN category and YOLO framework. They conclude that when comparing these two algorithms the later one has more advanced applications, is easier to develop a model with and unlike classifier based approaches used in other algorithms, YOLO uses a loss function which is directly dependent on the detection performance. Newer versions of YOLO provide the best possible compromise between accuracy and speed. Also it is stated that datasets used for training the model to better suit a particular idea and its applications play a vital part in the development process. All these factors result into better, generalized representation of an object than other approached used making it the best choice for applications that rely on fast, accurate object detection possibly in real-time applications.

Koo, Yongbon, et al. in [11] present a object detection framework which improves performance of the models by uti- lizing the graphics processing units (GPU) of the system. The most common platform for this task is the CUDA library by Nvidia. Here improvements in the existing OpenCL Darknet framework are worked upon using optimization techniques. Upon testing various hardware combinations it was founded that CUDA based GPUs perform better due to mature hard- ware level drivers used and the software development kit pro- vided by Nvidia. This results in reduced overhead performance losses and provide competitive performance benefits for lower costs.

IV. METHODOLOGY

There are two independent systems working in cohesion to provide a smooth operational experience and accurate predictions at the same time. These systems are discussed below:

A. Autonomous Drone System (Hardware) –

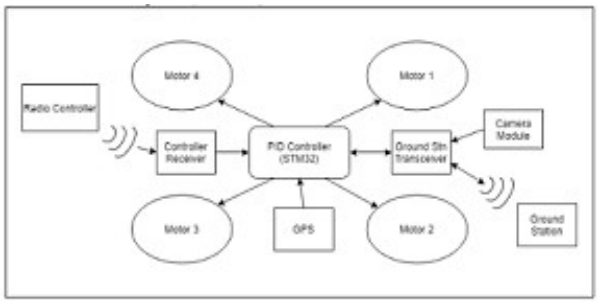


Fig. 1. Hardware Architecture.

Process Flow:

- The Controller transmits a PPM signal through radio waves and is received at the receiver.
- This loop continues till the user inputs into the remote controller.
- The GPS module provides coordinates to the micro con- troller and another set of coordinates i.e. the destination is provided by the ground station transceiver.
- The camera module sends serial data to the ground station through the same transceiver.
- All the inputs are processed in the micro controller and produces an output in the form of motor speed control such that the drone reaches the desired location.

B. The Real-time scene analysis model (Software) -

Flowchart for real-time analysis:

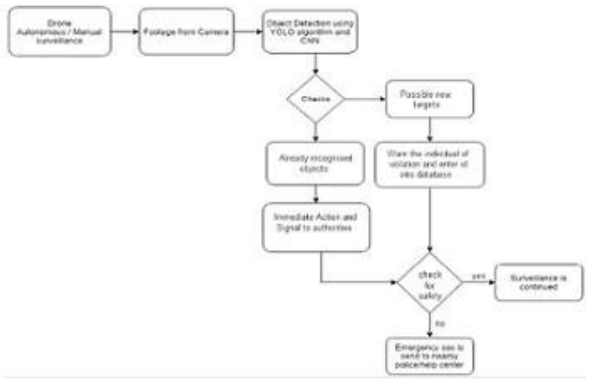


Fig. 2. Scene Analysis Flowchart.

Process Flow:

• The drone is set for surveillance which can be done manually or set to autonomous mode.

• All the footage captured from drone cameras are be- ing monitored on a station computer which uses object detection mechanism and YOLO framework for scene recognition to calculate distance between subjects using Euclidean distance formula.

• If the situation is resolved ensuring safety of individuals the surveillance is continued to another location else it captures the image of the individual and reports it to the base station.

V. MODELING

• The ground station desktop application is ready with the front end. It displays a map of the current coordinates and all the telemetric data related to drone

• This application also acts as a remote control and mon- itoring application using radio transmitters to transmit signals. It also acts as a command station to pass various safety features.

• The application is designed in C# as it has identical modules used in Embedded C for programming the microcontroller. C# the environment is object oriented hence it helps in processing the data related to multiple objects parallelly providing seamless experience.

• The prototype model of the drone is complete with partial hardware implementation. The design is made up of four arms with a central plate which holds everything together.

• The drone is configured in 'X' orientation such that the front face of the drone is the two motor holding arms.

VI. CODING RESULTS AND DISCUSSIONS

• Software implementation is completed for the ground sta- tion application. It provides essential information related to the drone and acts as a command station.

• The front end is as shown in Fig.3:

Fig. 3. Ground Station Control Application.

• This is a single frame application with a completely im- plemented backend which communicates with the drone via radio-wave serial transceivers from a remote location within a given range of about one kilometre line of sight and also collects telemetry data.

• This application also shows the information of the drone ie, its GPS coordinates and position on a map, distance travelled, total time of flight, waypoints to travel and other vital information like battery voltage and satellites in view are also displayed.

• The application acts as a guidance system for the drone to pass the waypoint coordinates and real time location of the drone, with failsafe features like return to home location.

• Real hardware is implemented according to the schematic diagram(Fig.4).

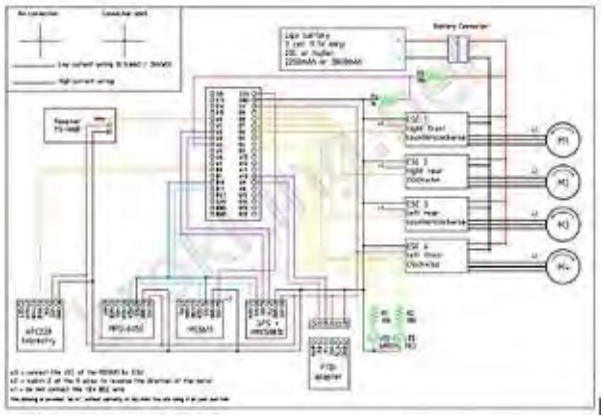


Fig. 4. Schematic Diagram.

• Datasets for training the machine learning models were collected for aerial scene analytics.

• YOLO framework was used to implement a Darknet model (a neural network) to perform specific video anal- ysis.

• The model detects the number of people in a given frame of the video. To achieve this a RCNN network is used to detect all the possible objects in the frame and then a CNN is fed all the objects and it decides whether the fed object is a human subject or not. OpenCV is used to draw a bounding box (green for safe and red for at risk) around the human subjects and distance between each of the humans is measured using a Euclidean distance between the centroids of the bounding boxes. (Fig. 5.)

• The program performs thousands of calculations in each given frame in order to generate a usable output.

To keep the output video smooth to the human eye it has to happen at least 24 times per second.

- In order to achieve the target frame processing time, the algorithm makes use of a parallel processing paradigm us- ing the systems GPU which provides better performance.
- However, this alone does not solve the frame time prob- lem. The amount of processing done per frame was also reduced at the cost of some accuracy.
- This resulted in 30 FPS for a HD (720p) feed and 21 FPS for a Full HD (1080p) video feed.

VII. CONCLUSION

The implementation of autonomous drone is competed suc- cessfully. The team researched about the Autonomous feature and Scene recognition techniques through various research papers. The drone successfully achieved a controlled flight with manual control and basic functions through ground station application along with a fully autonomous flight in a controlled environment. On the software side of the imple- mentation, the model can analyse the given footage with help of multiprocessing unit of the system and detect people, the tentative distance between them and whether the person is at risk or not. The limitation of the project being a very specific application of the image processing model is identified. This limitation will be addressed in the next revision of the image processing model based off of the results from the current version.

Fig. 5. Implemented Image Processing Result.

REFERENCES

[1] Y. Yuan, L. Mou and X. Lu, “Scene Recognition by Manifold Regu- larized Deep Learning Architecture,” in IEEE Transactions on Neural Networks and Learning Systems, vol. 26, no. 10, pp. 2222–2233, Oct. 2015, doi: 10.1109/TNNLS.2014.2359471.

[2] Al-Naji, A.; Perera, A.G.; Mohammed, S.L.; Chahl, J. Life Signs Detector Using a Drone in Disaster Zones. Remote Sens. 2019, 11, 2441.

[3] Y. Huang, L. Sithole and T. Lee, ”Structure From Motion Technique for Scene Detection Using Autonomous Drone Navigation,” in IEEE Transactions on Systems, Man, and Cybernetics: Systems, vol. 49, no. 12, pp. 2559-2570, Dec. 2019, doi: 10.1109/TSMC.2017.2745419.

[4] A. Devos, E. Ebeid and P. Manoonpong, ”Development of Autonomous Drones for Adaptive Obstacle Avoidance in Real World Environments,” 2018 21st Euromicro Conference on Digital System Design (DSD), Prague, 2018, pp. 707-710, doi: 10.1109/DSD.2018.00009.

[5] H. Saha et al., ”A low cost fully autonomous GPS (Global Posi- tioning System) based quad copter for disaster management,” 2018 IEEE 8th Annual Computing and Communication Workshop and Conference (CCWC), Las Vegas, NV, 2018, pp. 654-660, doi: 10.1109/CCWC.2018.8301782.

[6] S. Jung, S. Hwang, H. Shin and D. H. Shim, ”Perception, Guidance, and Navigation for Indoor Autonomous Drone Racing Using Deep Learning,” in IEEE Robotics and Automation Letters, vol. 3, no. 3, pp. 2539-2544, July 2018, doi: 10.1109/LRA.2018.2808368.

[7] Sandhu, Prabhjot. (2014). DEVELOPMENT OF ISR FOR QUAD- COPTER. International Journal of Research in Engineering and Tech- nology. 03. 181-189. 10.15623/ijret.2014.0304033.

[8] Sandeeep Khajure; Vaibhav Surwade; Vivek Badak Quadcopter Design and Fabrication International Advanced Research Journal in Science, Engineering and Technology Vol. 3, Issue 2, February 2016

[9] Andrew Gibiansky Quadcopter Dynamics, Simulation, and Control andrew.gibiansky.com

[10] Du, Juan. “Understanding of Object Detection Based on CNN Family and YOLO.” Journal of Physics: Conference Series, vol. 1004, Apr. 2018, p. 012029. DOI.org (Crossref), doi:10.1088/1742- 6596/1004/1/012029.

[11] Koo, Yongbon, et al. “OpenCL-Darknet: Implementation and Optimiza- tion of OpenCL-Based Deep Learning Object Detection Framework.” World Wide Web, Feb. 2020, doi:10.1007/s11280-020-00778-y.

This page is kept blank intentionally

E-Commerce Website for Visually Impaired

Adhik Pandey
Electronics and telecommuniction department
Thakur College of Engineering and Technology
Mumbai, India
adhikpandey53@gmail.com

Pratiksha Shrivastava
Electronics and telecommuniction department
Thakur College of Engineering and Technology Mumbai, India
shrivastavapratiksha99@gmail.com

Dharana Singh
Electronics and telecommuniction department
Thakur College of Engineering and Technology Mumbai, India
dharanasingh2000@gmail.com

Archana Deshpande
Electronics and telecommuniction department
Thakur College of Engineering and Technology Mumbai, India
Archana.deshpande@thakureducation.org

***Abstract*— In past few years many technologies has made their way into our lifestyle. Despite this somehow people with visual impairments find them difficult to use. One of the examples online shopping where it is difficult for them to browse website. Hence, the purpose is to make a website which can be easily accessed by people with visual impairments. Voice Synthesis API will help users to navigate from one section to another. Based on user's input message products will be shown and each product will have small voice description.**

Keywords*— *User Authentication, E-commerce, Easy Navigation, Speech Recognition, Speech Synthesis API

I. INTRODUCTION

According to the survey conducted in the year 2015, globally the number of people of all ages visually impaired is estimated to be 253 million of total population. So, it can be conclude that a large amount of crowd is facing the visual problems. Also, WHO claims that the rate at which the people are involving in technology and the speed, with which the immune system is getting weaker day by day, soon the world's large percentage of population will suffer from either partial or complete eye diseases. Hence, the need for technology to help such people is increasing day by day. Technology was always capable of serving its purpose for the welfare of society. Being said that let's take one step ahead with the possibilities of achieving and trying to help the people with vision problems. The problems faced by the peoples while performing activities such as online shopping will seem minute to us but its nerve wrecking for them. They suffer with basic problems like typing every single word also setting filters and being not be able check reviews for any product. As a result, navigation on a website seems toughest task. This all can be solved if there is a function which will help them in a way they are comfortable. Hence, the importance and objective of this project is to help the visually impaired people to get the benefit of online shopping. It will set an example and also create awareness for the need of such website. Many e-commerce website has been made till now for visually impaired people with some advantages and some disadvantages, hence it's a goal for us to implement maximum of advantages and to find a way to minimize the disadvantages. Website will have very basic features so the user with little bit knowledge of computers and technology can use it. Also, the product will be low cost hence affordable by all. The speech recognition algorithm used here is Deep Learning algorithm that has to process the acoustic waves i.e. speech signals to transform into character string. According to the resultant character string analysis results are shown. Since there are thousands of products with their categories there are lots of entries into the database. Hence to provide more flexibility and compatibility we are clustering a data and this clustering of data can be carried out using K-mean Algorithm. If there are too many results clustering won't help. Need to define method to get visually impaired users registered.
This paper introduces speech recognition for searching for products. This method of using speech for searching products instead of using keyboard provide an extra advantage to visually impaired people and allows them to use the application with more flexibility [1].This survey concludes that people with low vision can use screen readers such as Job Access with Speech (JAWS), or Window Eyes.Texts on web pages were resizable to improve readability.Allow the consumer enough time whenrequiring input; such as in making online transactions [2].The conclusion from this paper was for visually impaired people, product images should be displayed denoting their purpose and not appearances by using ALT-tags to allow screen readers to skip unimportant images.Websites were designed with customized portals to match with the differential speed categories of users [3].This paper introduces the use of a framework to enhance usability and navigation. Features like music to appraise the layout structure of a webpage, the use of mouse hovering to speak out glimpses of the underlying text.The framework is designed with the aim of providing speech based web access systems with better navigability through informed search [4].The aim of the authors is to define a basic but an efficient method of achieving usability especially for blind people. The proposed approach is based on defining voice-based functionalities over the E-Marketplace's interface that can be mapped and connected directly to the entire related databases which involve all required product details [5].

II. METHODOLOGY

Web development tools: JavaScript, SQL, HTML, CSS (SCSS), Node.js
In this paper we are proposing the methodology in three different. The division is as follows
(1) Front-end (2) Server side (3) Back-end.

1. Front-End:
i. HTML5, CSS3 and JavaScript are used for the front-end.
ii. The basic layout of the webpage is going to be built using HTML5 that defines the products or sections that are going to be present in our website.
iii. CSS is used to style the whole website, defining where the different products or sections are going to appear on our website.
iv. Then by using JavaScript, functionality is added to the website. It uses DOM manipulation method to target and store the particular elements like different products, sections, etc. which are defined in html file. JavaScript is used to introduce a voice-based assistant. This Bot (voice-based assistant) uses an API called "Speech Synthesis" which is going to convert the text in speech format and speak out the glimpses of text on which it is hovered on.
v. Hovering technique can easily be implemented using CSS and add the functionality of speaking out glimpses of text with the help of JavaScript. This is going to be useful for people having color-blindness.
vi. For consumers (users) suffering from complete blindness, the Bot will be enhanced to use speech recognition technique as people having complete blindness cannot access the mouse. The Bot is going to navigate them throughout the webpage using keywords used by the user (For example, if the user tells the bot to go to the electronics section in the webpage, the bot should understand this by picking up the keywords used while the user speaks).
vii. As the bot navigates to the section where user wants it to navigate, the bot also makes the user aware of what product section is opened by speaking the name of the section.
viii. User can navigate back and forth in the website by using simple keywords like "go back to the homepage" or "open men section", etc.

2. Server-Side Rendering:
i. For this, we are going to use Nodejs, a runtime environment for JavaScript will be used for the server side scripting
ii. In Nodejs, framework called Express will be used to create a local web server, to see the live changes taking place in website.
iii. An authentication regarding Log in and Sign up would be done using Nodejs.

iv. The login credentials would be then saved in local database.
v. Now whenever a registered user tries to log in and access the website, Nodejs takes this information about the user and checks inside the database whether this user is an existing user or not.
vi. Also, if a user forgets the password, it's easy to retrieve or reset his/her password.

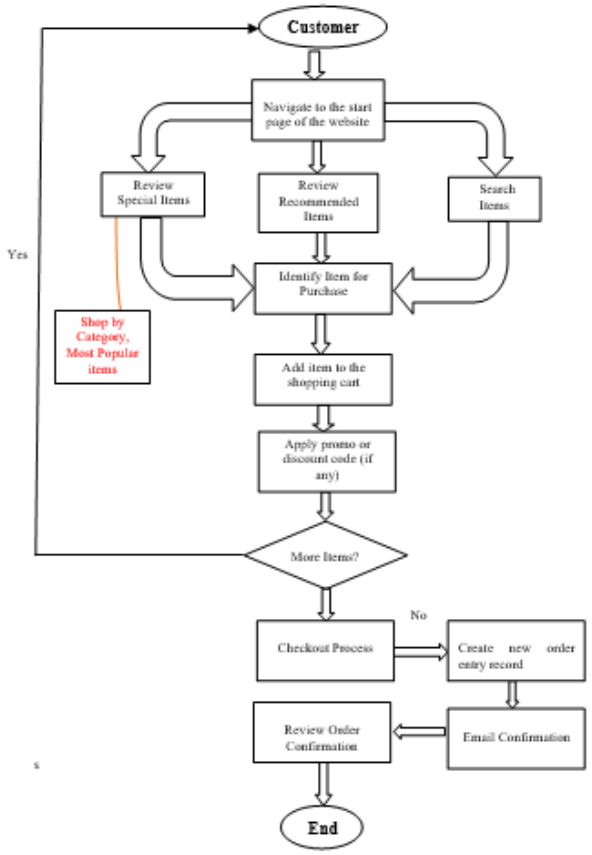


Fig 1. Flow diagram

III. RESULT

The website is device independent and can function on desktop, tablet and mobile phone as well. Below are some images with dimensions to justify the same.

Fig 2. Desktop view

Fig 3. After clicking on the menu option in desktop view

Fig 4. Tablet View (700 x 647 pixels)

Fig 5. Mobile view (500 x 530 pixels)

The user can roam on website without registering since, for impaired user make him/her to login just for visiting the website is quite inconvenient. As soon as user decides to buy or add to cart a particular product, he/she needs to login with their respective credentials to continue. If the user is new to website he needs to register first and if not he can directly login. The below flowchart explains the same.

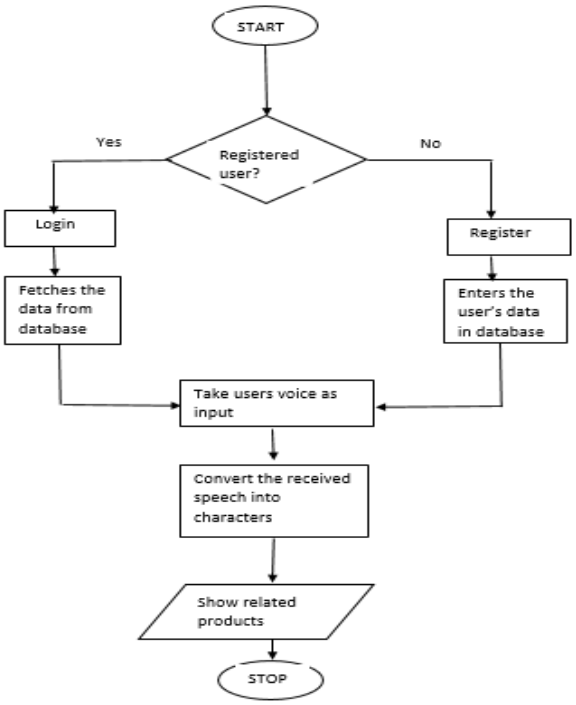


Fig 6.Flowchart

IV. CONCLUSION

The world is going digital in every possible way hence, the business owners need to make better decisions to be in the market [2]. This e-commerce website will fulfill such a need of the business owners when converted from prototype to a functional website and introduced in the market. The expectation was to build an interactive front-end which can accept voice as an input and can act accordingly, so navigation becomes much more easy for impaired users when compared to the normal existing websites. Concluding, it can be said that the goal is achieved. Considering many minute factors such as the color combination, neutral appearance of the website even then keeping it attractive, blocking maximum number of pop-ups which will improve the accuracy of the speech Bot, avoiding flashy things keeping in mind the comfort of users, we have designed the front-end.
Discussing the future scope it can be said that the website can turn into functional website from prototype. Facility of tracking order can be added. Data Analytics can be used in future for recommendation, personalized marketing and also to fill the gap between customer demand and product. Security is area that should be studied in future for this website. Also concentration can be shifted to more efficient web speech API. Website can further turn into website that can be used by people with visual disabilities as well as with no disabilities.

REFERENCES

[1] Roopa Bose "*Accessibility of E-Commerce Websites for Vision Impaired persons* ", thesis submitted at Western Graduate & Post-Doctoral Studies, 2014.

[2] Kunal Mohadikar and Rahul Nawkhare "*Ecommerce Based Online Shopping for Visually Impaired People Using Speech Recognition"*, International Journal of Development Research, Vol. 7, 2017.

[3] Ramiro Goncalves, Tania Rocha, Jose Martins, Fredrico Branco and Manuel Au-Yong-Oliveira "*Evaluation of e-commerce websites accessibility and usability: an e-commerce platform analysis with the inclusion of blind users*", Complexity in Information Systems Development: Proceedings of the 25th International Conference on Information Systems Development, 2017.

[4] Osama Sohaib and Kyeong Kang "*E-Commerce Web Accessibility for People with Disabilities*", 2017.

[5] Fahad Algarni, Yen Cheung, Vincent Lee "*An Intelligent Voice-Based E-Marketplace for Visually Impaired People*", Journal of Software Engineering and Applications, 2013.

[6] Prabhat Vera, Raghuraj Singh and Avinash Kumar Singh "*A framework for the Next Generation Screen Readers for visually impaired*", International Journal of Computer Applications, 2012.

Design a Website of Educators for Needy People and Suggest Application Area

Meghana Anthikad
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
meghana.anthikad@gmail.com

Sakshi Chavan
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
chavansakshi1910@gmail.com

Harneet Kaur Dehiya
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
harneet501.rk@gmail.com

Rashmita Kumari Mohapatra
Asst. Prof. (E&TC)
Thakur College of Engineering and Technology
Mumbai, India
rashmita.mohapatra@thakureducation.org

***Abstract* — One of the key fundamentals of building a society is common interest or shared aims of the group members. While researching for a social problem prevailing in the society right now, we came across the underprivileged children who have no means to attain education due to socio-financial issues. At the same time, we came across people passionate about social work and those who are willing to devote their time to teach these children and uplift the society. However, they lacked the direction to do so. Hence, we aimed to create a website named EDUCATOR that will bring all such passionate volunteers closer to the unprivileged children. In this website we will be capable of registering, storing and displaying tutor's and the NGO's data. Any person can register with the basic details/information that is asked such as the Name, DOB, Qualification, preferred day and time of the week when they would like to volunteer, etc. and then login to the website. Once the tutor is logged in, they will be able to see the list of NGOs registered on our website and from that the educator can choose the desired NGO that they want to volunteer on the basis of location. Once they select their desired NGO, they will be given the contact details of the NGO such as the phone number, email-id and the address, the tutor can then contact the NGO and set a date and time to volunteer at the preferred NGO. This paper presents a review of how we can bring together individuals for the upliftment of our society.**

Keywords —education, society, database, NGO, volunteer

I. INTRODUCTION

Java is the most widely used technology to design web applications since the past decade. JavaScript has emerged as a powerful tool that enables developers to build highly responsive web application while simultaneously providing access to powerful libraries to customize applications. Hence we brainstormed about how we can go around with our project. First, we decided how we wanted our target audience to navigate through our website. Then we decided how to work around the back end i.e. database. Once our basic skeleton was ready, we decided on a theme and the colours to be used. We looked at a few good websites for inspiration. Next, we started working on the coding of the static pages. After consulting and finalizing these with our guide we started working on the backend.

The entire coding was done in Eclipse IDE (Java EE module). Eclipse provides powerful functionalities to create dynamic web projects. The project was divided into two components – Web Pages and Process files. The Web Pages were created using HTML and CSS. Each page was created separately and then linked to each other. These interfaces were designed to form the front end.

The Process files were JSP files (Java Servlet Page) that established the connection between the front end and the MySQL Database in the backend. These pages took the data from provided through forms in the web and sent this data to the MySQL database in the back end. Some of these files were also made to be able to fetch data from the MySQL Database in the back end, and then display it to the user. Connection to the MySQL database was done with the help of JDBC (Java Database Connection) driver. It's because of the database connection that the user can view the data that was stored previously. The application is able to fetch the data of previous session as well as provide functionality to store the new data.

II. PROBLEM DEFINITION

Our problem statement involves two groups of people:
1.Underpriviledged children
2.Volunteers willing to teach

With this project it was very important for us to bridge the gap between these two types of people. Hence with the vision to provide these children with educational opportunities to make their dreams believable and goals reachable and to bring the people closer to such children we created this website name EDUCATOR wherein the volunteer can register themselves after which they will be suggested with various NGOs affiliated with us wherein, they can volunteer as per their convenience.

III. MOTIVATION

Education is an important aspect of life. It helps to improve our life and gives us the ability to read and recognize out rights as an individual and this might not be available to everyone. Providing educational opportunities to every child will enable them to come forward and contribute toward the economic progress and development of the country. There are so many kids with potential to do so well in life but they don't get proper education due to the socio-financial condition. So, this website is a step to provide education

to the unprivileged children and hence contribute to the upliftment of our society.

IV. LITERATURE SURVEY

Before we started designing our website, we tried to find similar projects on the internet. For the project Free Education Material for Poor Children by Wise Men Civic Welfare Association [1], we observed that they had a variety of causes and projects to volunteer in various countries out of which the predominant one was providing educational materials to the needy. It also provides with a provision to donate money to the organization by which study materials for the poor children will be provided. However, in addition with providing study material it is also important to have people who can teach them, our website focuses on the same and helps the people willing to help reach out to those in need by suggesting them with different NGOs to volunteer in.

In the project We Volunteer in India [2] founded in co-operation with two Swedish former volunteers – Signhild Örnberg and Gunilla Hillergren is one of a kind voluntary organization that offers the best volunteer opportunity in India with a unique home-stay option. It provides user with different projects to volunteer from child care to women empowerment projects. Our website focuses solely on the teaching project so that the attention of the people willing to volunteer is not diverted and no confusion is created with respect to which project to volunteer for.

In the website iVolunteer [3] they have options not just limited to volunteers but also for NGOs, for corporates and also for an internship in social services. The volunteering options are open all over the country and the user can select from a variety of causes to volunteer in and not just that, the user can also work for the website itself to help reach out to more number of people. Our website only focuses on the volunteers and our partnered NGOs.

V. PROPOSED DESIGN

The coding was done in Eclipse IDE (Java EE module) in order to design and implement the project. Eclipse provides powerful functionalities to create dynamic web projects. The project was divided into two components – Web Pages and Process files. The Web Pages were created using HTML and CSS. Each page was created separately and then linked to each other. These interfaces were designed to form the front end.

The Process files were JSP files (Java Servlet Page) that established the connection between the front end and the MySQL Database in the backend. These pages took the data from provided through forms in the web and sent this data to the MySQL database in the back end. Some of these files were also made to be able to fetch data from the MySQL Database in the back end, and then display it to the user. Connection to the MySQL database was done with the help of JDBC (Java Database Connection) driver. It's because of the database connection that the user can view the data that was stored previously. The application is able to fetch the data of previous session as well as provide functionality to store the new data.

The major objectives involved in project planning are listed below-

•The front end should be designed in a minimalistic approach such that database can be designed based on it without any alteration to the front end.

•The front view should be based on open-source tools hence only human resource cost should be involved in development

•The front end should be efficient to handle user interaction with backend.

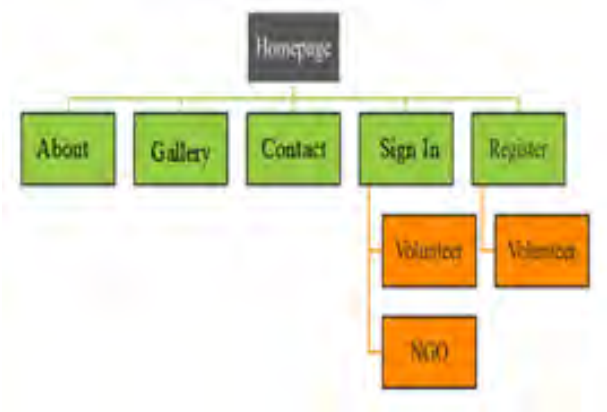


Fig. 1. Data flow diagram

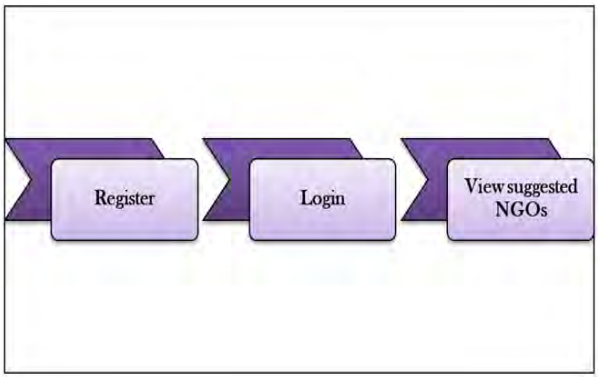


Fig. 2. Data flow for volunteer. Once a volunteer fills in details and registers, he/she is redirected to log in page. Upon successful login, he/she can view suggested NGOs based on the information provided

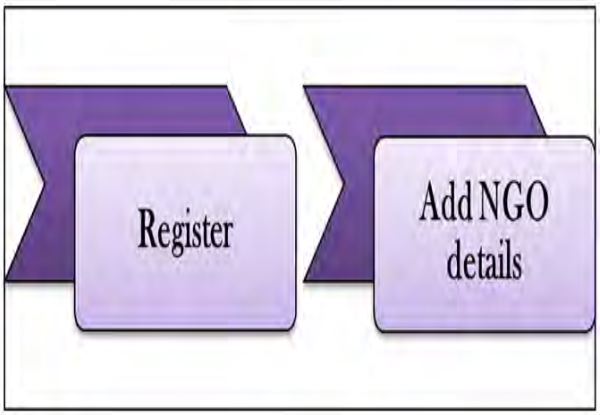


Fig. 3. Data flow for NGO. Upon registering with all required details, the NGO is added to the database and immediately displayed in the suggested NGOs section.

VI. RESULT & DISCUSSION

Fig. 4. Home Page

The Home Page shown above is the default page of the web application. It will show various post. It will also provide direct login and signup option on the navigation bar.

Fig. 5. About Us Page

The front end of the web application was successfully completed HTML, CSS and JAVASCRIPT. It consists of a navigation bar that has five basic options-home, about, gallery, contact, sign in, register. The navigation bar is visible on each of these five pages. Hence it provides the facility to user to access them. The navigation bar has been developed in such a manner that once a user successfully logins in his profile, it is no more available. Hence navigation bar is part of authentication layer.

Fig. 6. Gallery Page

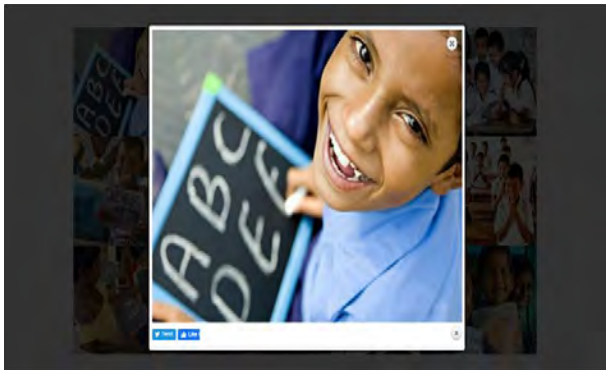


Fig. 6.1. After clicking on any picture in the gallery, it enlarges

Fig. 7. Contact Page

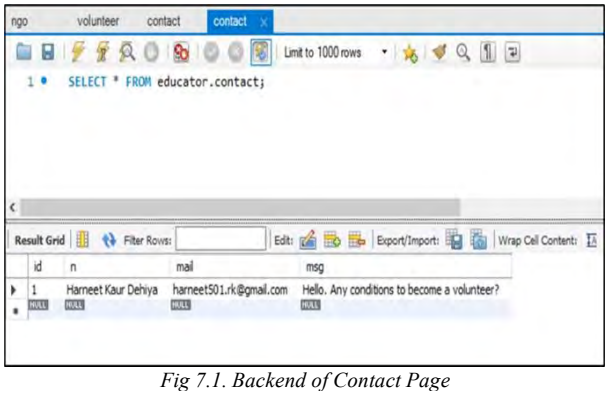
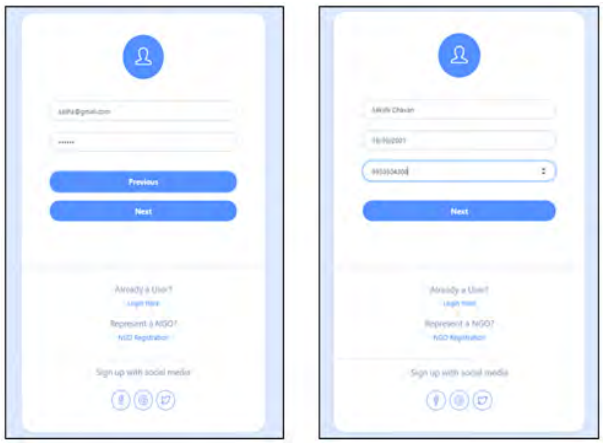


Fig 7.1. Backend of Contact Page

For any queries, user can contact the admin using contact page.

Next, we have the registration page where new users can register themselves by providing the basic information as shown below.



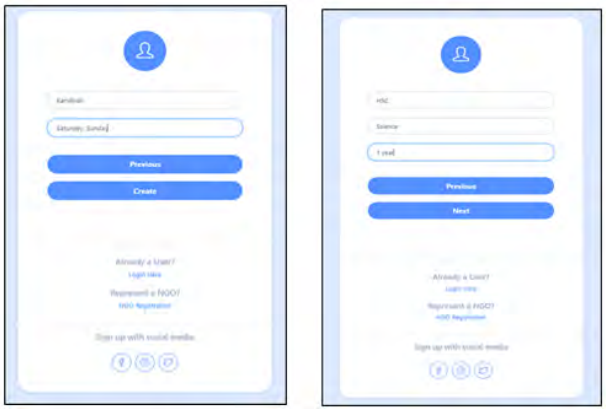


Fig. 8. Volunteer Regisration Page

When a new users wishes to register as a volunteer, he/she needs to fill basic details like name, date of birth, highest qualificatios, etc. in the Volunteer Registration Page as shown above. This data is stored in the backend of the page in a databse table as shown below. Once the user is registered succesfully, he/she is redirected to the login page. Upon successful login, he/she can see the suggested NGOs based on information provided.

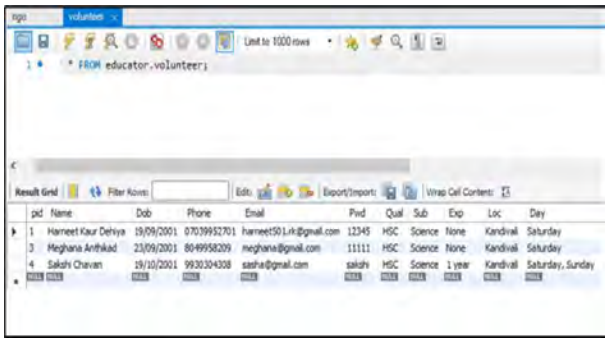


Fig 8.1. Volunteer Database

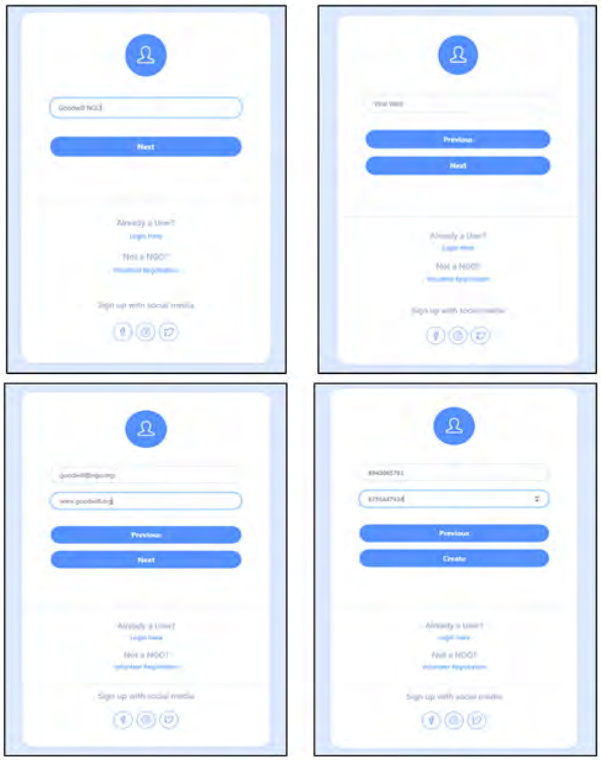


Fig. 9. NGO Regisration Page

NGOs can register themselves by providing basic information like Name of the NGO, Address, Email, Contact Number, etc. in the NGO registration page shown above As soon as the registration is succesfully completed, the data provided gets stored in the backend in a NGO Database Table shown below, and the information is immediately updated on the Suggested NGOs Page.

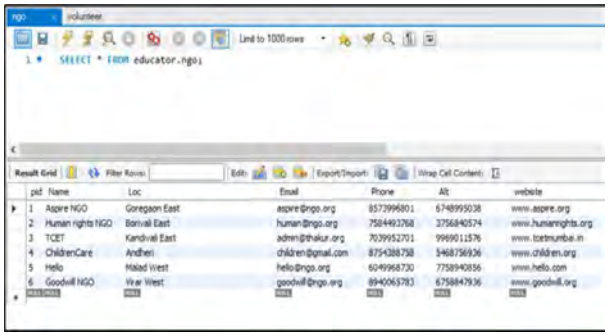


Fig 9.1. NGO Database

Fig. 10. Login Page

Fig. 11. Suggested NGO Page

VII. SCOPE OF THE PROJECT

A.User Lens

•NGOs: Different NGO's can register on our website so that the volunteer that is registered in our website can see the possible NGO's they can volunteer at.

•Educators: Anyone above 18 years of age who has minimum educational qualification of 12th Pass and wishes to teach. This can include full-time and part-time teachers and college going students.

B.Future Lens

•Using this website we have only connected the educators with the NGO's in future we can also incorporate advance features wherein the educator can directly contact the student.

•We can also add additional features like uploading notes and study material compiled by the educators for their student.

•We can reach out to colleges to request the different social bodies under them to register their volunteers as tutors to help the needy.

•We can have special lectures for personality development, physical education, sex education, and such related topics that are beyond academics.

•We can encourage institutes with good infrastructure to allow the kids to use their classrooms on the weekends so as to provide them with a real teaching learning experience.

VIII. CONCLUSION

The objective of this project was to research and identify an existing social issue and hence use our skills to build a website and create awareness about the same. The website EDUCATOR that we have developed is able to meet those requirements. As defined in the problem statement, our website is capable of accepting volunteer registrations and then suggesting them with various NGOs they can volunteer at.

All the pages in our website were made with the help of HTML and CSS keeping in mind that the website shall be pleasant and user friendly. Our website is a step forward towards the upliftment of our society. However, there is always a room for improvement in any software no matter how efficient the system maybe. The important thing is that the system should be flexible enough for future modifications. Since this website is our first ever attempt at making a live and responsive application, there is a lot of scope for improvements and future enhancements.

ACKNOWLEDGMENT

We would like to thank our college Thakur College Of Engineering And Technology for giving us an opportunity to work on this project. We would also like to thank our mentor Mrs Rashmita Kumari Mohapatra for guiding and helping us throughout this project.

REFERENCES

[1]https://www.globalgiving.org/projects/free-education-material-for-poor-children/
[2]\https://www.wevolunteerinindia.com/teaching-project/
[3]https://www.ivolunteer.in/
[4]https://www.connectfor.org/
[5]http://thecandleproject.org/
[6]https://www.ourbetterworld.org/story/frontlines-water-fight
[7]https://www.kidpower.org

This page is kept blank intentionally

Automated System for Transportation

Omkar Nandan Choudhary
Department of Electronics Engineering,
Thakur College of Engineering and Technology,
Mumbai, Maharashtra

Lovlesh Dagar
Department of Electronics Engineering,
Thakur College of Engineering and Technology,
Mumbai, Maharashtra

Vinay Manala
Department of Electronics Engineering,
Thakur College of Engineering and Technology,
Mumbai, Maharashtra

Sunil Khatri
Department of Electronics Engineering,
Thakur college of Engineering and Technology,
Mumbai, Maharashtra

***Abstract*—The project aims to build an automated system for public transportation as well as for carrying goods and services using Intel's Galileo process computing chip. The automated system will receive relevant data from various cameras and ultrasonic sensors. This automated system reaches the given destination safely and intelligently thus human errors are avoided. Algorithms like lane line detection, obstacle detection, work together to provide the necessary control to the automated system. This paper shows the research and testing for lane detection, path planning for remotely controlled vehicles as well as driver's safety measures. The working results describe the algorithm tested as fit and efficient.**

Keywords— automated system, transportation, obstacle detection, lane detection. path planning, remotely controlled vehicle, testing,

I. INTRODUCTION

In the last decade both academia and the industry is focused on building autonomous vehicles. This has resulted in massive development in sensing and computational technologies. The drive for such a change is bringing about a revolution in the way mankind travels, thus reducing the number of traffic accidents occurring due to driver negligence. We are proposing an autonomous system which can be implemented in urban areas as a solution for traffic problems and accidents faced daily in such areas.

As such a transportation system will have a huge impact in the way we travel it is not surprising that a number of attempts have been made to implement autonomous vehicles, in 2004 DARPA Grand Challenge was organised where a vehicle was asked to navigate a 150-miles off-road track, here no teams were able to reach the finish line. In a similar event in 2005 5 teams were able to complete the challenge, DARPA Urban Challenge was organised in 2007 where vehicles were required to drive in a simulated urban environment autonomously, here six teams passed proving that such a task is possible.

The idea is to have a fleet of autonomous vehicles which can communicate with a central hub which can guide them on the journey, this reduces the computational complexity required on every individual vehicle.

In the initial stage we are planning to build a level 4 autonomous system which will be designed for urban areas. The driver will be in the drive seat and can choose not to drive the car and the autonomous system will take care of the journey. For such a system to work a robust sensing and localisation system is required to be able to accurately measure the current state of the vehicle with respect to its surroundings.

To create this system, we are using lane detection and SLAM simultaneously, this enables us to judge the drivable portion of the road, estimate our current state and map the surrounding. The benefit of this method allows us to map and save the data regarding the area in which the vehicle ventures and can be used in the future for another trip to a now familiar area. The map created will be stored in a central hub and will be shared with all other autonomous vehicles in the area as a reference map using which the vehicles will be able to localize better and improve the state estimation.

II. METHODOLOGY

A. Lane Detection Algorithm

More than 1.47 lakh people of India died due to road accidents in 2017 which majorly includes Car crashes. And the numbers are increasing in every year of about 1lakh people. There is a need for an automated system that detects the lanes for the driver without the driver's input [1]. The system should warn the driver if the car goes into the wrong side of the lane by controlling the driver's steering wheel and the battery management system to get frequent indications regarding internal hardware status.

Path planning, Lane detection have been researched by many students, professors, engineers., etc [2][3]. However, in the first section, we will be discussing how we can understand and implement the lane detection algorithm.

The research for understanding the lane detection algorithm can be analysed in the following steps provided:

I. Judge the image containing the lanes on the roads.

II. Convert the image from RGB2GRAY for tracing the lanes and doing further computations on the image. Convert the 3channels to 1channel It is a two-dimensional image with matrix ranging from (0, 255).

III. Apply the Gaussian Blur algorithm which will do the convolution on the image, which will apply the standard 5×5 matrix on the image to

filter or reduce the noise in the image and the transition of strong to weak gradient.

IV. Apply the canny algorithm where the transition of strong to weak gradient is traced on the adjacent parts of the matrix and display the corresponding image with white edges to identify that there was a strong to weak transition. The remaining parts which fall below the low threshold are shown as 0 or black. The canny algorithm is designed to work as a function on the x and y coordinates as columns will be x axis and rows as y-axis. Taking the derivative of each adjacent part of the matrix the image is drawn.

V. In order to trace the lanes of the road consider the specific part of the image where the actual algorithm will work known as the **region of interest (ROC)**.

VI. A polygon is identified on the image and using the matplotlib we extract the coordinates of the polygon we intend to make.

VII. To trace the edges of the lane or the tracks. By using the Hough Space algorithm. Here using the Cartesian coordinate system, we can identify the points intersect using the space method. By using the line equation, we can maintain the space by using m as slope on y-axis and the b as y-intercept as x-axis. But the vertical line cannot be represented in space since the x-axis is 0 and the slope becomes infinity.

Alternative to the Cartesian coordinate system is the Polar coordinate system that has been used where the line equation becomes.

$p = x \sin(0) + y \cos(0)$.

The coordinates will be (rho,0). whereas rho represents the perpendicular distance from the origin and the theta determines the angle drawn with respect to the x-axis making a clockwise angle and converting it to radians we get (ρ, 0). The space will be ρ (rho) as y-axis and θ (theta) as x-axis. Where 1 Degree = $\emptyset$/180 radian.

Lines P(src, rho=distance resolution of accumulator and pixels , theta is the angle resolution of accumulator and radians, threshold = min no of votes needed to accept a candidate line).

B. Path Planning

After the data about the surrounding is obtained the path planning process begins. There are various algorithms which can be used for the path planning process. To detect our path we will need to know our destination and our position with respect to the destination on a map. For this localization and positioning methods are required. As cameras are our main sensor, we are using V-SLAM (Visual Simultaneous Localization and Mapping). As shown by P Pini'es *et al.* method of conditionally independent sub maps has constant runtime thus solving the computational complexity problem of EKF SLAM [4].

This method will give the current state of the vehicle while simultaneously mapping the surroundings. In SLAM the objective is to compute the probability of the upcoming state and map taking the previous measurements and states as input. Here Kalman Filter is used to estimate the state [5]. This map generated from this technique will be saved on a remote server to act as a reference for future manoeuvres in the same environment. Levinson *et al.* have used LiDARs to make similar online maps to allow real time localisation for a fleet of autonomous vehicles. This solves the problem of mapping and localisation [7][8].

To reach a pre-specified destination we are proposing to create a look-up table which will save the path between two previously visited nodes and allow more efficient navigation in more frequented paths, this is true for urban regions. For a path novelty we propose to have a GPS map which will allow us to observe our path with respect to the destination and then Dijkstra's Algorithm is used to plan a route between these two points [9].

1. Actuation

For actuation of the vehicle we are proposing a drive by wire technique that will enable us to control the vehicle in the autonomous mode without having to mechanically actuate the accelerator and the braking input, this of course depends on the architecture of the vehicle on which this system is implemented.

At our current stage we are proposing a plan for level 4 automation, as per the six levels of driving autonomy defined all levels of automation under level 5 are required to have the provision of human interception in the functioning of the vehicle. In such a case it is required for the vehicle to detect human input to steering, acceleration and braking. In case of steering and braking the detection of human input is quite straightforward but in case of steering accurately reading the steering torque is required to hand over the control of the vehicle to the driver [9].

For accurate actuation a model of the vehicle is needed. Here the unicycle model will be used, but a constraint for continuous steering is required. Increasing the model complexity by considering wheel slip, inertia and chassis dynamics will make the control problem difficult to solve [10].

2. Driver Safety

It is necessary to ensure a safe driving experience for the user of the autonomous vehicle. As our vehicle is depending on a human driver to take control of the vehicle in case of an emergency it is always required for the driver to remain alert. To detect tiredness and drowsiness of the driver various methods can be used, for example Khusaba et al. used electroencephalogram, electrooculogram, and electrocardiogram signals to detect driver drowsiness but these are intrusive and can cause stress and irritation to the driver [11]. So, a non-intrusive method for driver monitoring is required, this can be done by visual detection of the driver's state by looking for unique signs of fatigue on the driver's face. These include eye movements, yawning and head

movements. But just visual detection is not enough. The vehicle needs to act on these detections. OYINI MBOUNA et al. used a single camera mounted in front of the vehicle to detect the pupil movement and head movement to detect the state of the driver [12].

III. Testing

A. Remotely Controlled System

Thus, the first phase of the system is controlling the system remotely. Controlling the system can be done by web interface or mobile app interface. Since the system will be using a GSM module it is easy to connect a web or mobile interface with it and Galileo will be used as a microcontroller.

To avoid delay in commands using an android app is preferable. To connect an android app with Galileo, firebase database is used which will take command from android app. The Galileo is then integrated with the GSM module, this module will read the change in real-time firebase database and will send further commands to Galileo accordingly.

As we know, nowadays everyone uses an android phone thus, building an android is more feasible. Android OS is open-source OS. Using and building an android app is quite easy. We will be using Android Studio to build a simple app to control automated systems. The backhand app uses JSch library which is written in JAVA language.

The first page of the app will have a login/signup page where users will either login to their existing account or will register themselves. The second page will contain a few switches like lock, unlock, locate, headlight ON/OFF, taillight ON/OFF, etc. These buttons will be used for controlling the automated system.

B. System with autonomous obstacle avoidance

To avoid obstacles before collision the system will have to detect its surroundings. To do so it will be fitted with Ultrasonic sensors (for short distance detection).

The Ultrasonic sensor will be fitted at its front and along the sides. This will allow the bot to sense any incoming obstacles. Once it senses an obstacle it will try to move to move away from them.

The bot will be moving in a fixed path so it will only have to avoid the obstacles coming in that predetermined path.

IV. Result

In this paper we presented an autonomous system that can be implemented in a vehicle having a stereo camera. The stack which we implemented used EKF SLAM instead of Bayes Filter, this improved the quality of the maps generated as the EKF was able to handle non-linear inputs unlike Bayes Filter. This paper also touched the actuation part of the autonomous system, including driver safety as is the priority while designing any vehicle.

1. The lane detection algorithm implementation.

The images of the result from the lane detection algorithm are as follows:

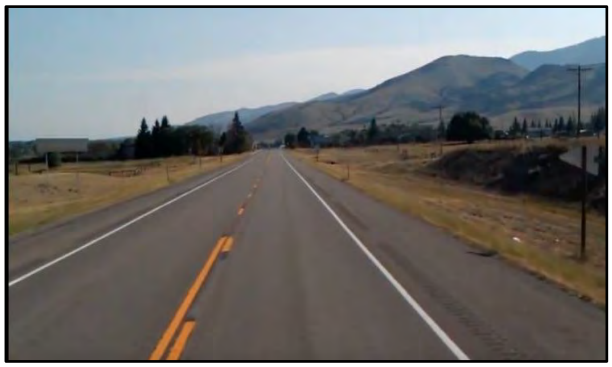


Fig. 1 The pre-run image (original scene)

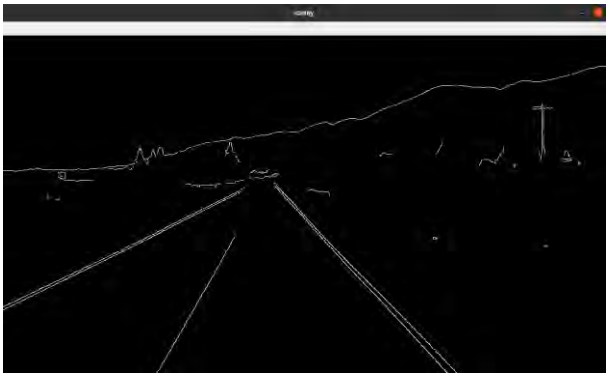


Fig. 2 Noise Reduction based edge images on canny operator

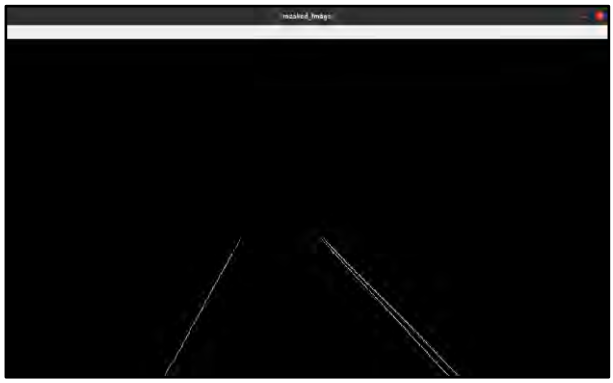


Fig. 3 The masking of image performed on noise reduction phase image

Fig. 4 The result of lanes detection

2. Prototype building

This is a prototype of a remote-control system by simulation where it uses a motor, LED & NodeMCU-esp8266. The LED and Motor are controlled by an

android application. The NodeMCU-esp8266 is connected to the firebase database to take commands and send it to the Arduino simulator through COMP port of desktop.

The android application will remotely control the LEDs and the motors which is required for prototype building.The application will send the commands through an app which will get stored in the firebase cloud as a NoSql database. The NodeMCU-esp8266 will fetch the data from the firebase and forward it to the Arduino connected via COMP port and remotely controlling the prototype.

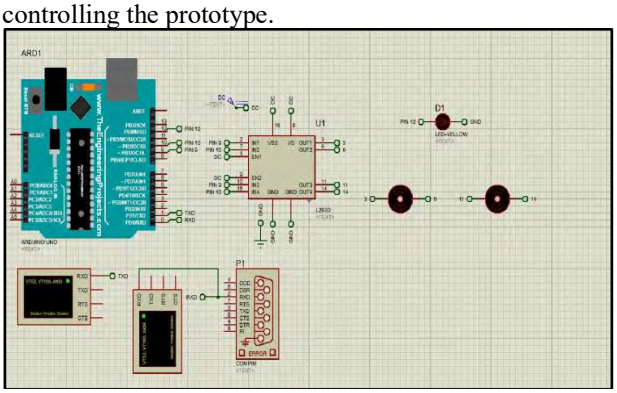


Fig. 5 Circuit diagram of remote-control system by simulation

Fig. 6 Remotely controlled application for prototype building

V. Conclusion

Here we presented a method to implement the autonomous system based on SLAM with continuously updated maps and a real time localization method. This enables each vehicle in a fleet to localize itself and know the position of other vehicles. Utilizing this problem of traffic congestion in urban areas can be solved.

VI. Future Scope

As a future scope we are planning to design a system in which the individual vehicle can communicate with each other and enable us to avoid traffic congestion.

References

[1] Broggi, A. Cappalunga, C. Caraffi, S. Cattani, S. Ghidoni, P. Grisleri, P. Porta, M. Posterli, and P. Zani, ³Terramax vision at the urban challenge 2007´, IEEE Trans. Intell. Transp. Syst., Vol. 11, No.1, pp. 194-205, Mar. 2010.

[2] T. Kasai and K. Onoguchi ³Lane detection system for vehicle platooning using multi-information map´, ITSC,2010 13th International IEEE Conference on, 19-22 Sept. 2010, pp. 1350±1356.

[3] Robust lane detection and tracking for lane departure warning Yue Dong;Jintao Xiong;Liangchao Li;Jianyu Yang (2012) International Conference on Computational Problem-Solving (ICCP).

[4] P. Pini´es and J.D. Tard´os. Large-scale slam building conditionally independent local maps: Application to monocular vision. IEEE, Transactions on Robotics, 24(5):1094–1106, 2008.

[5] P. Pini´es and J.D. Tard´os. Scalable SLAM building conditionally independent local maps. In IEEE conference on Intelligent Robots and Systems (IROS), 2007.

[6] Levinson, J., & Thrun, S. (2010). Robust vehicle localization in urban environments using probabilistic maps. 2010 IEEE International Conference on Robotics and Automation. doi:10.1109/robot.2010.5509700

[7] Lategahn, H., Geiger, A., & Kitt, B. (2011). Visual SLAM for autonomous ground vehicles. 2011 IEEE International Conference on Robotics and Automation. doi:10.1109/icra.2011.5979711

[8] Online Sensing of Human Steering Intervention Torque for Autonomous Driving Actuation Systems Xin Wang, Longxiang Guo, and Yunyi Jia*, Member, IEEE, Sensors-20365-2017

[9] Paden, B., Cap, M., Yong, S. Z., Yershov, D., & Frazzoli, E. (2016). A Survey of Motion Planning and Control Techniques for Self-Driving Urban Vehicles. IEEE Transactions on Intelligent Vehicles, 1(1), 33–55. doi:10.1109/tiv.2016.2578706

[10] McNaughton, M., Urmson, C., Dolan, J. M., & Lee, J.-W. (2011). Motion planning for autonomous driving with a conformal spatiotemporal lattice. 2011 IEEE International Conference on Robotics and Automation. doi:10.1109/icra.2011.5980223

[11] EEG-based drowsiness estimation for safety driving using independent component analysis, Chin-Teng Lin;Ruei-Cheng Wu;Sheng-Fu Liang;Wen-Hung Chao;Yu-Jie Chen;Tzyy-Ping Jung, IEEE Transactions on Circuits and Systems I: Regular Papers, Year: 2005 | Volume: 52, Issue: 12 | Journal Article | Publisher: IEEE

[12] Oyini Mbouna, R., Kong, S. G., & Chun, M.-G. (2013). Visual Analysis of Eye State and Head Pose for Driver Alertness Monitoring. IEEE Transactions on Intelligent Transportation Systems, 14(3), 1462–1469. doi:10.1109/tits.2013.2262098

Development of Food and Medicine Serving Model Using Obstacle Mapping

Shruti Shukla
Department of Electronics
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
shrutishukla1999@gmail.com

Sriya Vaishnav
Department of Electronics
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
sriya.vaishnav@gmail.com

Rishabh Sajwan
Department of Electronics
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
sajwanrishabh2@gmail.com

***Abstract*—We have seen how the pandemic has affected many people across the world. Out of all people, our healthcare workers are the most at risk. Keeping their health and well being in mind, we propose a medicine and food serving model with the main purpose of reducing exposure of healthcare workers to the infected patients, by delivering food or medicines to the patients in isolation ward from one designated desk area.**

Other functions the model intends is to sanitize the areas frequented by people, to allow communication between the patient and doctor without a doctor in close proximity, to move in two modes: automatically without the interference of any human and manually which can be directed to a particular place with help of software remote.

Keywords—Social Distancing, MERS, SARS

I. Introduction

In this covid-19 breakout, social distancing must be practiced. It is proven that if a person, touches things (with the possibility of contamination) used by the patient/infected or stays in the vicinity of the infected, is at a risk of being infected themselves.

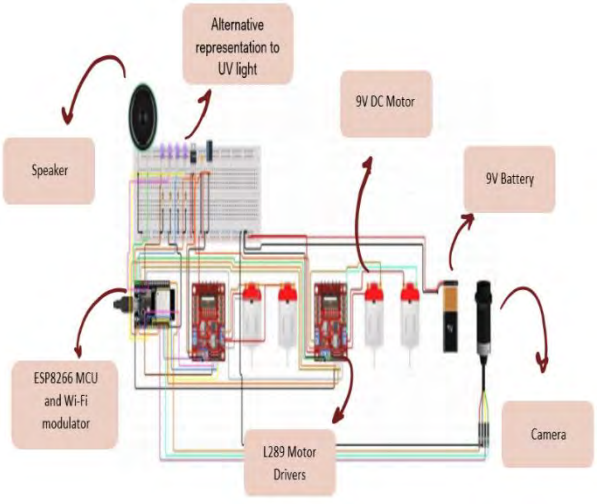
Health care workers and care takers at the hospital have a threat of getting in contact and infected as the transmission is high. The disease yet remains unknown in many areas, which makes it riskier to handle apart from the fatalities.

With the current scenario of hospitals not being able to servethe ever-increasing numbers of infections, it is particularly important to provide a safe working environment to the Healthcare workers. The proposed model can help in this situation with maintaining distance between healthcare workers and patients to minimum.

II. Methodology

Fig.1. Block Diagram

Fig.2. Circuit Diagram showing the Hardware assembly



The*Components Used:*

1. ESP8266 Modulator,
2. L289N Motor Driver,
3. Batteries,
4. Robot Chassis,
5. Wheels,
6. 9V DC Motor,

7. UV Tubes,
8. Unity App,
9. MIT App Inventor.

The input is taken from the camera phone fitted at the top of the model and it is passed to the controller. We have unity software and ESP8266 cam working as controller. Unity software does the image processing and notifies the ESP8266 camera. The controller notifies the motor driver to stop via unity software and the model stops. In this way the obstacle has been detected. There is a UV light fitted at the bottom of the model is used for sanitizing. The whole system works on lots of power supply.

Analysis steps:
1.The Micro Controller used for our project is ESP8266 Wi-Fi Modulator, which has inbuilt Wi-Fi that will be employed in the communication modules.
2.The Micro Controller will be connected to one or two Motor Driver/s. These motors will be joined to the wheels of robot chassis.
3.The project has one motor driver because it will:
- Reduce Cost,
- Reduce Circuit Area,
- Remove Redundancy,

4.The motors used have 200 rotations per minute, which will give it decent time to cover the distance from main Desk to the patient.
5.The sanitizing module is separately placed from the main the main circuit, with direct power connections to itself.

The working of the proposed System is as follows:

- We have a phone camera fitted at the top of the model which takes the input by image processing when there is obstacle in the path.

- We have four motor drivers connected at the bottom of the model and four wheels connected. We use two controllers here one of them is unity software and the other one is ESP8266 cam which is fixed at the top of the model.

- The instruction is passed to unity software and it gives the instructions to ESP8266 controller.

- The controller passes the instructions to the motor driver and the wheels stop. In this way our model detects the obstacle.

- We can achieve communication between doctor and patient through ESP8266 cam and there is a speaker connected beside it which gives the output of the doctor.

- We also have a UV Light fitted at the bottom of the model which is connected to battery and it is always on which sanitize the floor, or the path covered by the model.

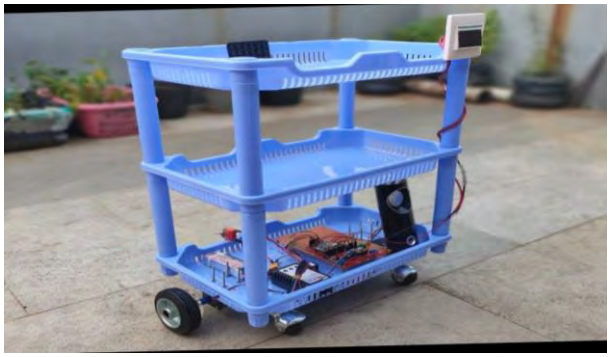


Fig.3. Representation of Model

III. FLOWCHART

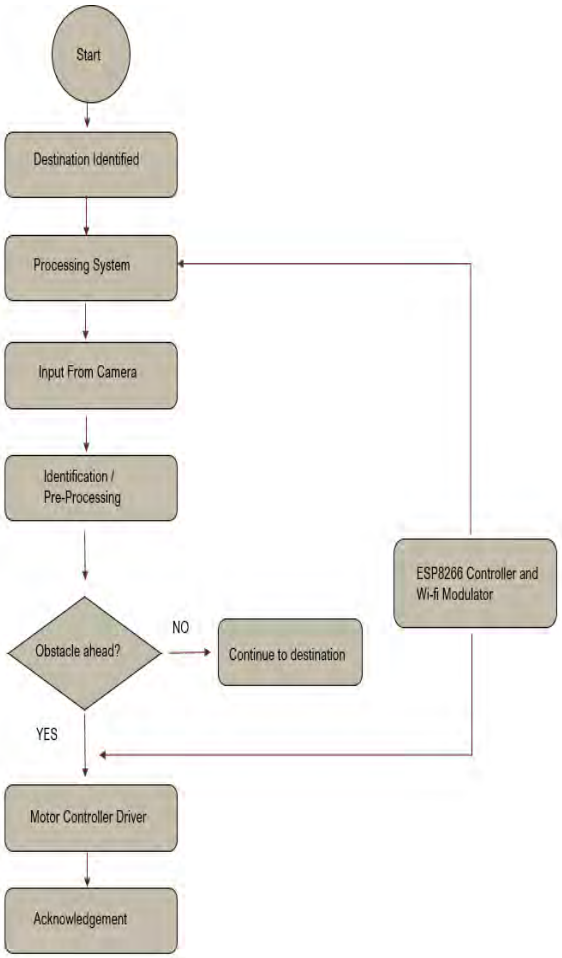


Fig.4.Flowchart of Software and Hardware working together

Fig.5. Flowchart of Communication Module

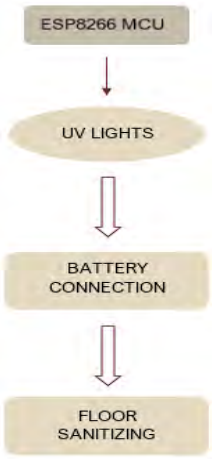


Fig.6.Flowchart for Sanitizing Module

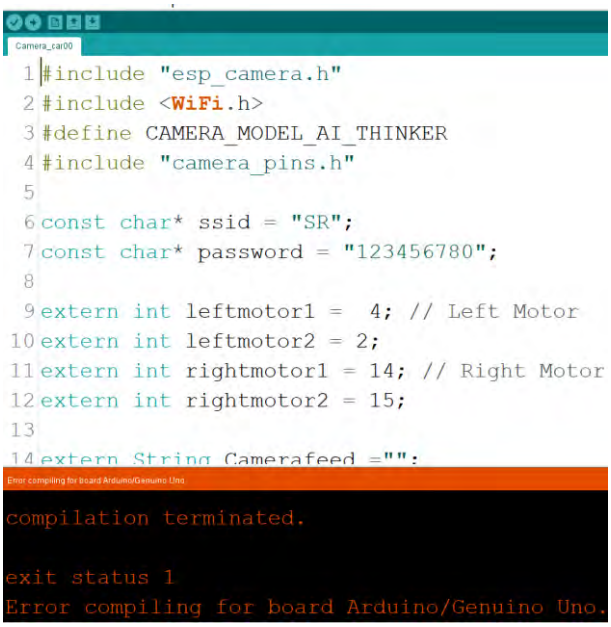
Fig.7. Screenshot of the application on a phone

IV. RESULTS

- Remote controller/Application Software: The model can be operated in real time operated through an application.

Advance design added in the project:

1. Thermal temperature sensor:



```
#include "esp_camera.h"
#include <WiFi.h>
#define CAMERA_MODEL_AI_THINKER
#include "camera_pins.h"

const char* ssid = "SR";
const char* password = "123456780";

extern int leftmotor1 =  4; // Left Motor
extern int leftmotor2 = 2;
extern int rightmotor1 = 14; // Right Motor
extern int rightmotor2 = 15;

extern String Camerafeed ="";
```

```
compilation terminated.

exit status 1
Error compiling for board Arduino/Genuino Uno.
```

Fig.8. The present status of Camera code in Arduino UNO IDE

It checks body temperature at real time and record the temperature. It will check the body temperature of the patients and keep the record.

2. Heartbeat pulse sensor:
It checks heartbeat of the patients and keep the record of the old and young people. This helps to keep the record so that the disease could be analyzed at initial point.

3. UV tubes at the bottom for sanitization:
UV tubes are fixed at the bottom of the model so that it sanitizes the floor.

V. FUTURE SCOPE

- Hospitals:
  - Isolation Wards for dangerous communicable diseases like MERS, SARS, COVID-19,
  - Communicating with Patients without Physical Involvement,
  - Can be used in Home quarantine or containment zones to deliver packages,
- Sanitizing:
  - Hospitals,
  - Public sectors,
  - Public Transportation
- It can also be used in Pharmaceutical go downs while storing medicines to deliver and pickup from main entrance to the designated area.
- After the Pandemic ends with some additional arrangements, it can be used to deliver food or medicines to patients according to a timer.

VI. CONCLUSION

The model will minimize the exposure of healthcare workers to the infection, while serving the patients their daily medicines and meals. The model will require very less maintenance in terms of sanitizing after it serves food in isolation ward and to operate it. We hope to make lives of people involved in this fight better.

ACKNOWLEDGMENT

We are grateful to the environment our college “Thakur College of Engineering and Technology” was able to provided for us, in order to complete our project- “Development of Medicine and Food Model Using Obstacle Mapping”, even in this unprecedented Pandemic. Their constant support, critique and availability is something we appreciate. Our internal Guide Mr. Hemant Kasturiwale never allowed our circumstance to get the best of us and we are thankful to him for imparting many skills to us. Our timely complete is because of the constant support of the internal guide, Our HOD- Dr. S.C. Patil sir and the faculty, who taught us the very basics.

REFERENCES

[1]. ESP 8266 for control and monitoring in smart home apple. Lailis Syafa'ah, AgusEko Minarno, Fauzi Dwi Setiawan Sumadi. IEEE. (2019).

[2]. The robot engine-making the unity 3D game engine work for HRI. Christoph Bartneck, Marius Soucy, Kevin Fleuret, Eduardo B. Sandoval IEEE. (2015).

[3]. Robotic arm wields UV light wand to disinfect public spaces. Yves Crama, Olaf E. Flippo, Joris van de Klundert. IEEE. (2020).

[4]. Autonomous WIFI-rely control with mobile robots. Yannick Verbelen, Davy Van Belle. IEEE. (2016).

[5]. A pocket guide to indoor mapping. Mrs. Archana Prasanthi, G.V. Rohit. IEEE. (2013).

[6]. Prospects and challenges for sanitizing UV light emitting diode. O. Cakir, H. Temel, M. Kiyak. IEEE (2009).

[7]. The designing of training simulation system based on unity 3D. Kuang Yang, Jiang Jie. IEEE (2011).

[8]. Research on path planning of family nursing robot based on robot operating system. Wenlei Zheng, Lei Cheng, Jian Huang, Yating Dai, Chuang Shang, Rui Peng, Zhihua He. IEEE (2016).

[9]. Multi-Sensor orientation tracking for a Façade-Cleaning Robot. Mohankumar G.B., Kavisapareesawri. V, Swathi. T. IEEE. (2020).

Smart Attendance System

Aditya Sumant Mishra
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
adityam1342@gmail.com

Shivam Ajay Pandey
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400
*101*shivam15082000@gmail.com

Arun Kumar Singh
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400
*101*arunks2902@gmail.com

***Abstract*—Itis expected today that an individual who wants to authenticate himself for a service must have a token and/or password for example identity card, ATM card, driving license, health card and so on. Carrying different cards and remembering passwords for different services is a significant issue for individuals and organizations. A secure and effective identity management system plays an important role in the successful deployment of an attendance management system. To make the identity management system more secure and reliable for authentication, biometrics data are integrated in the attendance management systems. Biometrics technologies verify identity through characteristics such as fingerprints, faces, irises, retinal patterns, palm prints, voice, hand-written signatures, and so on. These techniques, which use physical data, are receiving attention as a personal authentication method that is more convenient than conventional methods such as a password or ID cards because it uses data taken from measurements and such data is unique to the individual and remains so throughout one's lifetime. In these technologies, fingerprint becomes the most mature and popular biometrics technology used in automatic personal identification. The reason for the popularity of fingerprint verification is that fingerprints satisfy uniqueness, stability, permanency and easily taking.**

Keywords:Fingerprint scanner, Database, Biometric attendance, Smart Attendance System.

I. INTRODUCTION

Taking attendance of small group of students is ok but when it comes to take attendance of students in a university or institution it becomes a tedious job for faculties to do so. Multimodal Attendance System is a smart system that uses technology such as Smartphone, sensor, database and internet to mark attendance and stores its data in a excel sheet and send it to respective faculty.In this paper, an attempt was made to look at the prevalence in the high level of impersonation experienced on a daily basis in both private and public sectors, the ghost worker syndrome which has become a menace across all tiers of government, employers concerns over the levels of absence in their workforce and difficulty in managing student attendance during lecture periods. Sequel to this, a fingerprint-based Attendance Management System was developed to provide a faster, more secure, and more convenient method of user verification than passwords and tokens can provide for a reliable personal identification

II. LITERATURE SURVEY

Smart attendance system have emerged in the past decades as integrated solutions for attendance assistance and monitoring is based on a comprehensive system designs, prototypes and proposals have varied systems for fall and agitation detection active sensor-networks, emit alarms or act autonomously against detected proxy. There were few advantages of previous system like more secure (Additional Vein recognition, RFID + Biometrics.

Many researches have implemented Fingerprint based attendance system which makes use of a fingerprint sensor/scanner along with other technology. These systems are classified based on the tools and technique used to implement the system.

A) IOT based-Hardware of this system include ARM9 S3C2440 processor board, FPS200 solid state fingerprint sensor. Database is designed using SQL database management system. In addition to fingerprint biometric, Vein recognition is also used. The main function of the system includes automation of attendance and login of grades. Internet of things is an interaction of device using internet. It allows real time attendance using certain websites.

B) RIFD and android-This attendance monitoring system uses RIFD technology where students has to swipe RFID card along with fingerprint. An android application is made through which system can be accessed from anywhere. The system can also access the location of students and faculties. Online SMS system is used to send information to the parents.

III. RESEARCH GAPS

Implementation of efficient biometric attendance system requires certain parameter to be satisfied such as low cost and speed of the system in recording and maintaining the attendance, security of the system, power consumption of different unit of the system, cost of implementation, portability and functionality. Existing projects lacks some important parameters. Different technology can be combined to implement a system an efficient and easy to use system.above diagram depicts the structure of the system

IV. PROBLEM DEFINITION

Smart attendance system for academic and organization with low cost, high speed for recording and maintaining attendance, secured, proper functionality.

V. PROPOSED METHODOLOGY

The project will work as a biometric attendance record that will use fingerprint scanner in conjunction with bar code scanning. The device will store the fingerprint impression of all the faculties and students of an institute through the process of enrolment. During the attendance the registered fingerprint of the student will match the fingerprint in the database. In case of match the student details will be register in the database and the data will be transferred to the authorized personal to monitor and keep the record. This device once used will be secured and can be activated by the fingerprint of the authorized personal. The device will be low-cost, robust, potable and user-friendly.

To mark attendance one has to open the application in mobile and place his/her finger on fingerprint sensor of mobile and then the smart attendance recognizes the fingerprint of the student and marks the attendance for particular lecture and store it in a excel sheet. After all the lectures is done the application sends the excel sheet to respective faculty to mark attendance. In case if ones fingerprint sensor is not working then a alternative fingerprint scanner can be provided by faculty to mark the attendance.

Smartphone
|
Fingerprint Scanning/ Barcode Scanning
|
Stores fingerprint in excel sheet
|
Real time sharing of students Information
|
Sends data to administrator.

VI. EXPECTED OUTPUT

The project once completed should have following parameters: low-cost, high speed for recording and Sends data to administrator.

VII. CONCLUSION

Attendance system can be made of low-cost, high speed for recording and maintaining attendance, secured, proper functioning, robust and user friendly. This will also save time and environment

REFERENCES

[1] K. Adewole, S. Abdulsalam, R. Babatunde, T. Shittu and M. Oloyede, "Development of fingerprint biometric attendance system for nonacademic staff in a tertiary institution", Development, vol. 5, no. 2, pp. 62-70, 2014.

[2] S. Rao and K. Satoa, "An attendance monitoring system using biometrics authentication", International Journal of Advanced Research in Computer Science and Software Engineering, vol. 3, no. 4, 2013.

[3] S. Gagare, P. A. Sathe, V. T. Pawaskar and S. S. Bhave, "Smart Attendance System" in International Journal on Recent and Innovation Trends in Computing and Communication, 2014..

Automated Ration Distribution System

Ashish Paul
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
ashishpaul1819@gmail.com

ShubhamKarangutkar
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
shubhamkarangutkar17@gmail.com

Swastik Banerjee
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
sb.banerjee777@gmail.com

***Abstract*—TheIn India despite all the growth and development is different sectors and industries the food delivery system or the Public Distribution System (PDS) remains the same. In the current system which is present there are many flaws and bugs.**

The existing public distribution system in Ration shops requires manual measurement of quantity and maintenance of record of transactions. Many problems are encountered by the existing system such as,

1. Ration distribution to unauthenticated card holders.

2. Card holders wasting time in queues for collecting ration for hours.

3. Lots of malpractices such as hoarding, black marketing and overcharging.

4. Human intervention in updating transactions and maintenance of records in ledger is difficult.

The project titled Automated Ration Distribution and Delivery System proposes an automatic method of distribution of commodities to authenticated card holders. Also, the details of transactions made are maintained in a database. The users need to access to their account through the Smart phone by entering their ID and password.

Automatic distribution of commodities is achieved by using DC motors controlled directly by Raspberry pi to open and close the valves.

To dispense the commodities, user is expected to provide fingerprint for next level of authentication. Once user is verified, the system dispenses a threshold quantity of commodities for the particular family.

I. INTRODUCTION

Government provides food, oil and fuel to economically challenged people at subsidized rates which are distributed to the public through ration shops. The stocks for these ration shops will be bought from the farmers and then sold at subsidized rates. Every month fresh stock arrives at these shops and that needs to be distributed to public. The owner of most of the ration shops resort to malpractices and the allotted amount of ration is not distributed to authorized people. To counter these fraudulent activities this system is developed which incorporates the following features

1. Fingerprint authentication system used to identify a particular user making the system secure
2. The commodity and its quantity need to be selected using android application.
3. Predefined information about the amount of ration to be distributed.
4. Automatic ration distributing mechanism

Under the Public Distribution System (PDS):

The central government procures and supplies special essential commodities to fair price at fixed central issue prices. In the past, a number of items like iodized salt, palm oil, candles, ghee, cloth etc. have been distributed through the PDS, however at present department of food and supplies have confined the fair price distribution to few cereals, wheat, rice, sugar and kerosene oil. At present India has 4,78,000 ration stores operating across many localities, villages, towns and cities in the country making it the largest distribution network in the world. Department of food and supplies is providing ration cards to the citizens based on their economic conditions. There are mainly two types of cards:

1. below poverty line (BPL) cards
2. above poverty line (ABL) cards

II. SCOPE OF PROJECT

Our main objective here is to automate the process of the distribution. The classical method involves customer to tell the person handling the ration shop outlet, the amount of the commodity he/she needs and the type too. The person working then measures the commodity and gives it to the customer. In our version of the system, we will develop an embedded system project where we will have the customer to input the amount he requires and the system made will automatically collect that much amount in a container.It is a new concept which takes into account the various social, economic and general aspects relating to technical as well as day to day disciplines.This system consists of touchscreen, GSM and billing printer which are then interfaced to raspberry pi. The ration card holder would have to swipe the smart card on the system.

Smart card can be accessed by entering the password which was given to all ration card holder separately but there is chance to loss or miss use of the smart card. To overcome this system must include the finger print detector of all family member if the enter password and finger print matched then smart card can be accessed

III. CURRENT SCENARIO

Every month, tons of food grains are procured from farmers under the Public Distribution System (PDS). These food grains go through a supply chain involving multiple stakeholders, including Central and State

Governments and the Food Corporation of India, eventually arriving at Ration Shops.

The Indian food security system was established by the Government of India under the Ministry of Consumer Affairs, Food and Public Distribution to distribute food and non-food items to India's poor at subsidized rates. Major commodities distributed include staple food grains, such as wheat, rice, sugar and essential fuels like kerosene, through a network of fair price shops (also known as ration shops) established in several states across the country. Food Corporation of India, a Government-owned corporation, procures and maintains the public distribution system (PDS).

The public distribution system of India is not without its defects. With coverage of around 40 million below-poverty-line families, a review discovered the following structural shortcomings and disturbances.

Growing instances of the consumers receiving inferior quality food grains in ration shops.

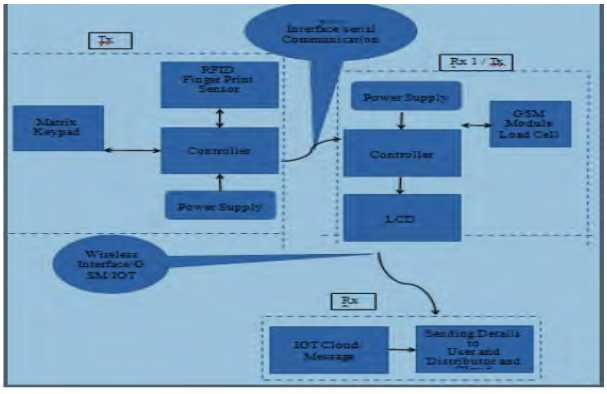
Rogue dealers swap good supplies received from the Food Corporation of India (FCI) with inferior stock and sell the good quality FCI stock to private shopkeepers. Illicit fair price shop owners have been found to create large number of bogus cards to sell food grains in the open market.

Numerous malpractices make safe and nutritious food inaccessible and un- affordable to many poor thus resulting in their food insecurity.

Identification of households to be denoted status and distribution to granted PDS services has been highly irregular and diverse in various states.

The recent development of Aadhar UIDAI cards has taken up the challenge of solving the problem of identification and distribution of PDs services along with Direct Cash Transfers. Regional allocation and coverage of FPS are unsatisfactory and the core objective of price stabilization of essential commodities has not met.

IV. Designing of Block Diagram



1. Customer who is already provided RFID card will scan their card at EM-18 module
2. RFID number will be verified with the Dataset of Government. If the number matches with the number in database and customer have enough balance in their account then they will be promoted to selection step..
3. If the card is not valid then “Invalid/Not valid” message will be displayed on the LCD screen and they will not be given access to the next step.
4. If the card is valid then “Valid User” message will be displayed on the LCD and they will be asked to enter the product key of ration they want(e.g. 1. Wheat, 2. Rice, 3. Fuel)
5. All the customers will have by default maximum monthly spending limit to ensure that everyone gets the fair chance.
6. Based on the material that customer enters further action will be taken. If customer enters the solid ration such as wheat or rice then conveyor belt will be rotated

V. Implementation Steps w.r.t to Hardware and Software

Hardware:

The consumer will scan his RFID card or his fingerprint for verification purpose. Once the verification is done, the Raspberry-PI will start the system and the amount of ration will be dispensed.

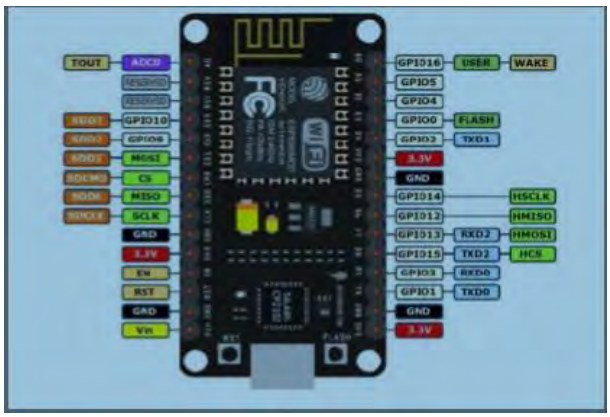
After this, the R-pi will send a feedback message to the consumer through the GSM

Our project is unique in a manner where we are providing features like a feedback loop for accurate measurement and dual verification process.

In this project, the components that are used are as follows.

NodeMcuController :

1. Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
1. Operating Voltage: 3.3V
2. Input Voltage: 7-12V
3. Digital I/O Pins (DIO): 16
4. Analog Input Pins (ADC): 1

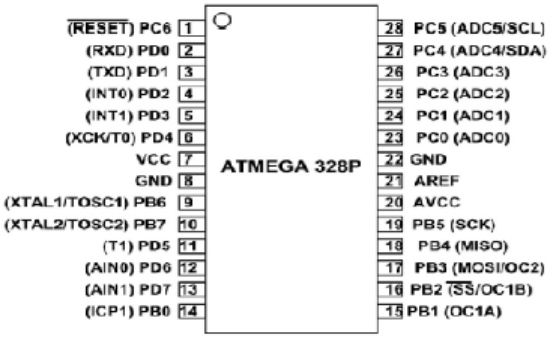


Atmega328P (Controller):

ATMEGA328P is high performance, low power controller from Microchip. ATMEGA328P is an 8-bit microcontroller based on AVR RISC architecture. It is

YES

the most popular of all AVR controllers as it is used in ARDUINO boards.It comprises 14-digit I/O pins. From these pins, 6-pins can be utilized like PWM outputs



LCD Display:

LCD modules are very commonly used in most embedded projects, the reason being its cheap price, availability and programmer friendly. Most of us would have come across these displays in our day to day life, either at PCO's or calculators. The appearance and the pinouts have already been visualized above now let us get a bit technical

Fingerprint Sensor Module:

1. Voltage supply: DC 3.6 to 6.0V
2. Current supply: <120mA
3. Backlight color: green
4. Interface: UART

RFID Module:

MFRC522 RFID module is a highly integrated readandwrites card chip.Itworksin13.56MHzcontactless communication. It is a low cost, low voltage, small size, contactless card chip. It finds its application in intelligent instruments and portable handled devices. This module follows all the protocols of 13.56MHz passive contactless communication method, which makes it use advanced modulation and demodulation methods.

Load cell (Weight Sensor):

A load cell is a transducer that is used to create an electrical signal whose magnitude is directly proportional to the force being measured. The various types of load cells include hydraulic load cells, pneumatic load cells and strain gauge load cells

HX711 Amplifier:

HX711 module is a Load Cell Amplifier breakout board for the HX711 IC that allows you to easily read load cells to measure weight. This module uses 24 high precision A/D converter chip HX711. It is a specially designed for the high precision electronic scale design, with two analog input channel, the internal integration of 128 times the programmable gain amplifier. The input circuit can be configured to provide a bridge type pressure bridge (such as pressure, weighing sensor mode), is of high precision, low cost is an ideal sampling front-end module

Matrix Keypad: This 4-button keypad provides a useful human interface component for microcontroller projects. Convenient adhesive backing provides a simple way to mount the keypad in a variety of applications. The Keypad 1×4 features a total of 4 buttons in Matrix form. This is a membrane keypad with no moving parts. A female 5-pin berg connector is required for interfacing it with your microcontroller circuits.

GSM Module:-

SIM900A Modem is built with Dual Band GSM based SIM900A modem from SIMCOM. It works on frequencies 900MHz. SIM900A can search these two bands automatically. The frequency bands can also be set by AT Commands. The baud rate is configurable from 1200-115200 through AT command. SIM900A is an ultra

compact and wireless module. The Modem is coming interface, which allows you connect PC as well as microcontroller with RS232 Chip (MAX232).

DC pump Motor:-

Micro DC 3-12V Micro Submersible Pump Mini water pump For Fountain Garden Mini water circulation System DIY project. This is a low cost, small size Submersible Pump Motor which can be operated from a 3 ~ 12V power supply. It can take up to 120 liters per hour with very low current consumption of 220mA. Just connect tube pipe to the motor outlet, submerge it in water and power it. Make sure that the water level is always higher than the motor. Dry run may damage the motor due to heating and it will also produce noise.

L298N Motor Driver:-

An H-Bridge is a circuit that can drive a current in either polarity and be controlled by Pulse Width Modulation (PWM). Pulse Width Modulation is a means in controlling the duration of an electronic pulse. In motors try to imagine the brush as a water wheel and electrons as a the flowing droplets of water. The voltage would be the water flowing over the wheel at a constant rate, the more water flowing the higher the voltage. Motors are rated at certain voltages and can be damaged if the voltage is applied to heavily or if it is dropped quickly to slow the motor down. Thus PWM. Take the water wheel analogy and think of the water hitting it in pulses but at a constant flow.

Software:
1.Arduino IDE (Programming Steps) a. Used to Design the code for the controller of the project. b. Compiling the code for checking errors. c. Upload/Burn the code in the Controller using Controller Board Kit.
2.KiCad (PCB Designing Steps) a. Designing PCB using this software. b. PCB Designing Steps(Hardware) i. PCB design Printing on Glossy Paper ii. Transferring Design on Copper Clad Board. iii. Etching the PCB with Solution. iv. Drilling the holes in the PCB. v. Soldering the Components on PCB.
3. IOT APP (UBIDOTS/Blynk) a. Creatinga account on the IOT Cloud. b. Generating authentication token using mailid. c. Login using id and password. d. Design the GUI (Graphic User Interface). e. Connecting IOT app/cloud with controller.

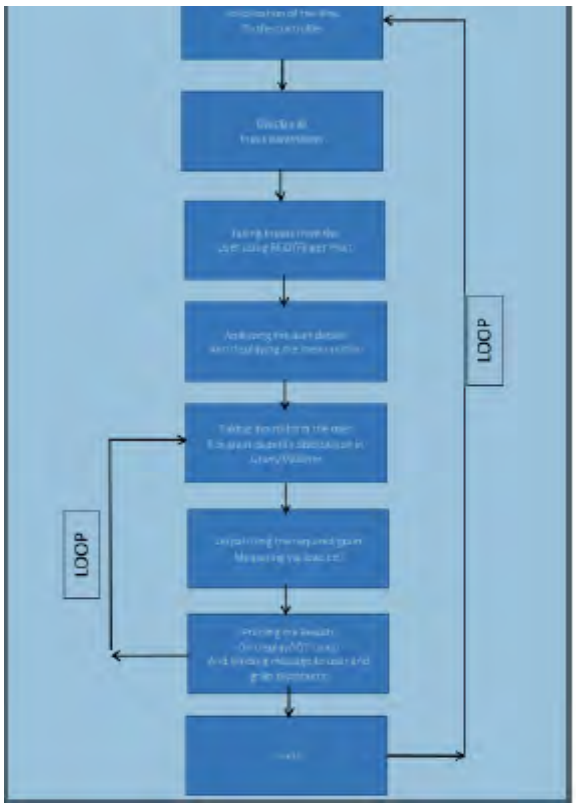


Figure 1- Flowchart of Ration Distribution System

ACKNOWLEDGMENT

This project cannot be entirely created by an individual. The timely completion of the project 'Automatic Ration Distribution and Fraud Detection System' has been possible because of our teacher and project guide Mrs. Jyoti Kori who provided us with guidance and motivation throughout its making.We thank him for giving us an opportunity to create this project.We are also thankful to Dr. S. C. Patil (Electronics Department, HOD) for her guidance and to our parents for providing all possible resources to gain the best possible knowledge.Finally, we would thank our college 'Thakur College of Engineering and Technology' for providing

us with a platform and the necessary facilities to make this project.

REFERENCES

[1] Bhalekar D, Kulkarni R, Lawande K, Patil V, Online Ration Card System by using RFID and Biometrics, International Journal of Advanced Research Computer Science and Software Engineering 5(10), pp. 849- 851, October- 2015

[2] Sharath P, Prabhakar S, Jain A, On the individuality of fingerprints, IEEE Transactions on Pattern Analysis and Machine Intelligence, VOL. 24, NO. 8, pp: 1010-1025, 2002

[3] Swapnil, Chetan, ashlesha, Ashwini "Automatic Ration Distribution System –A Review" IEEE 978-9-3805-4421-2/16.

[4] Md. Wasi-ur-Rahman, Mohammad TanvirRahman, TareqHasan Khan and S. M. LutfulKabir, "Design of an Intelligent SMS based Remote Metering System", Proceedings of the IEEE International Conference on Information and Automation, 2009, pp. 1040-1043.2014

[5] A.W Ahmad, N. Jan, S. Iqbal and C. Lee, " Implementation of ZigBee- GSM based home security monitoring and remote-control system", IEEE 54th International Midwest Symposium on Circuits and Systems (MWSCAS), 2011, pp. 1-4.

[6] Mohit Agarwal, Manish sharma, Bhupendra Singh and Santhanu, IEEE, "Smart Ration Card Using RFID and GSM Technique", IEEE978- 1- 4799-7/14.

[7] S.Valarmathy, R.Ramani, "Automatic Ration Material Distributions Based on GSM and RFID Technology" International Journal Intelligent Systems and Applications, 2013, Vol. 11, pp. 47-54.

This page is kept blank intentionally

Subject-wise Learning Management System

Adnan Abidi
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
adnanabidi2014 @gmail.com

Irfan Khan
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
irfankhan1120010@gmail.com

Dr. Payel Saha
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
payel.saha@thakureducation.org

***Abstract*— With so many different social media applications being used for the purpose of education at this time of quarantine, there is a clear need of a dedicated application for student and teachers to communicate. An application that can be used for doubts, discussions and announcements in an organized manner while managing student, teacher and learning data systematically. This web application has simple UI elements designed using CSS and is backed by a MySQL database, scripted in php. The application environment is well optimized for learning and managing large amounts of users and their data.**

Keywords— Learning Management System, Social Media, Web application, Online Learning.

I INTRODUCTION

Social media platforms and numerous other communication platforms are being repurposed as a study tool all over the world. This necessitates development of a new application solely dedicated to the purpose of Learning. It will handle all kinds of Doubt Solving interactions between students and teachers online as well as announcements and discussions. The idea is to create the front end of the proposed learning web application using HTML and CSS. The front end will have navigation bar that provides the client to choose among basic three options offered - Home, Login and Signup but with separate sign in options for teacher and student. The login page will have an authentication layer to identify people and maintain privacy. The Signup page should ask client for email and some identification data. The users can Login with their respective email addresses and passwords. The Subject Teacher login page is designed to redirect the teacher to their respective classroom. All classroom data as well as user data of students and teachers is stored in the MySQL database.

II. PROBLEM DEFINITION

Currently, many social media applications are being used for online learning in quarantine and a lot of important data is unorganized and the application environment is generally found to be chaotic. With the data not being handled in an organized manner, there is a lot of confusion that needs to be sorted. Therefore, a new learning management system must be created.

III. MOTIVATION

The pre-existing social media websites have been designed with a different purpose in mind. [1] This kind of platform will not only lead to students being distracted but also be an inadequate learning environment in general. This online learning tool has been designed with one sole purpose of learning and therefore it is much more efficient. It is a dedicated application built for focus. It is simplistic and it does not have any distractions.

IV. LITERATURE SURVEY

In the paper titled [2]'Using the Facebook group as a learning management system: An exploratory study (2011)' By Qiyun Wang Huay Lit Woo Choon Lang Quek Yuqin Yang Mei Liu, Facebook groups were used to make communication easier for students and teachers while keeping information organized but we identified that with the recent updates, Facebook poses privacy risks to its users. The environment in itself is very unprofessional as it is clearly not optimized to act as a Learning Management System.

In the paper titled [3]' "WhatsApp, Teacher?" - Student Perspectives on Teacher Student WhatsApp Interactions in Secondary Schools (2018)', By Hananel Rosenberg Christa S. C. Asterhan Student's views on WhatsApp groups being used as a Learning Tool for information sharing have been depicted. But, as this application is majorly used as a personal daily messenger by many, it cannot be used as specialized application for education. And the data is generally very unorganized and hard to manage

In the paper titled [4]' Determination of Student Opinions on Usage of Social Media and Mobile Tools in Student-Teacher, Student-Student Communication (2019)' By Hasan Denizalp Fezile Ozdamli, the advantages of using various social media applications for Teacher Student Communication have been shared. But having educational content spread out across so many different platforms causes confusion. It is better to have one dedicated application specifically for education.

V. PROPOSED DESIGN

The proposed design is based on minimalist approach to UI. The front end is designed in such a manner that users won't face any kind of difficulty in locating the options. The proposed system is implemented using php for server-side scripting as the software is free and non-proprietary. It incorporates CSS design features to provide some simple aesthetic to the web application.

The project will later be designed on free cloud storage that is offered by Firebase but to convert it into large-scale, a client will be required to purchase the cloud storage as per cost determined by Firebase Inc. As the number of users increase, the amount of data to be stored and updated will increase tremendously. Hence major chunk of cost involved in project will be purchase of cloud storage.

The basic approach was to design the front end in such a manner that it supports good UI simply by help of open-source technology.

The major objectives involved in project planning are listed as follows -

i. The front end should be designed in a minimalistic approach such that database can be designed on basis of that without doing any kind of alteration in front view.

ii. The front view should be based on open-source tools hence only human resource cost should be involved in development.

iii. The front end should be efficient to handle user interaction with backend.

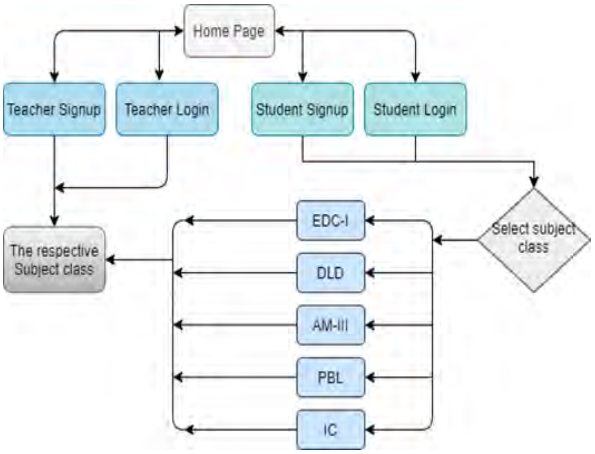


Figure 1. Data flow diagram

VI. RESULT & DISCUSSIONS

The front end of the web application was successfully completed using CSS styling techniques over the simple HTML form style approach. It incorporates a navigation bar overlay that has five options namely– Home (College Classroom or Logo), Teacher Signup, Teacher Login, Student Signup, Student Login. The navigation bar is visible on all pages. Hence it provides the facility to user to access them. The navigation bar has been developed in such a manner that once a user successfully logins in his profile, it is no more available. Hence navigation bar is part of authentication layer. Once the authentication is completed, it is changed by the code. Once the user has signed in to their account, the navigation bar provides the option of redirecting to Home Page or Logging out of the account

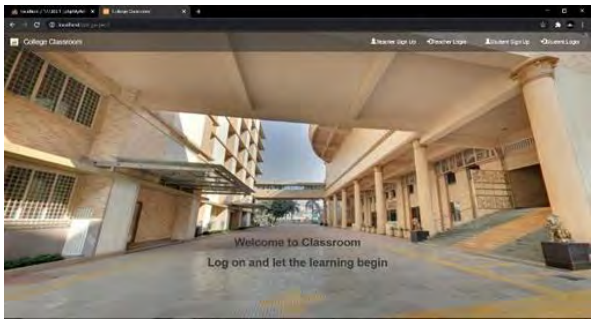
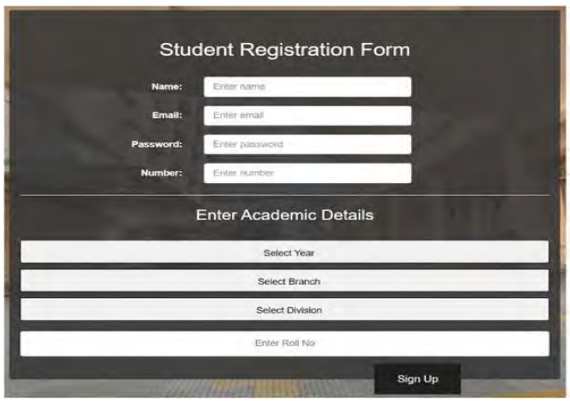


Figure 2. Home Page

The Home Page shown in figure 2, is the default page of the web application. The next webpage is Signup page. It's the first page with which user interaction begins. Every new user will be required to provide data such as email for identification, password for account privacy. These will be basic credentials which will be used for authentications at later stage. While developing this page we have taken special care of checking validity of email address provided by user. The code checks whether the email address given by the user matches the standard email format or not. The Signup process is deemed successful only when email is correct and input of all required field has been completed.



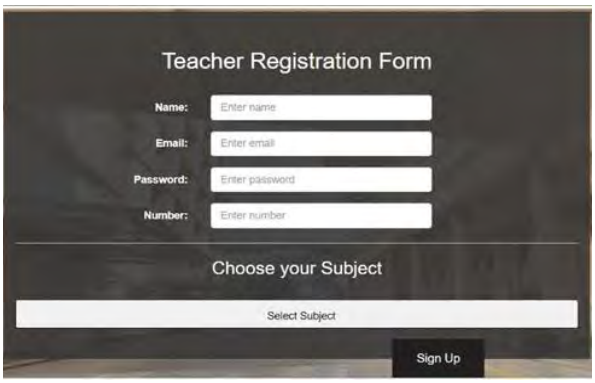


Figure 3. Signup Pages

The next web page that we have created is Login page. It will act as an intermediate between authentication and user data layer. The access to profile is granted only if user enters the correct credentials that match with the credentials stored in the MySQL database.

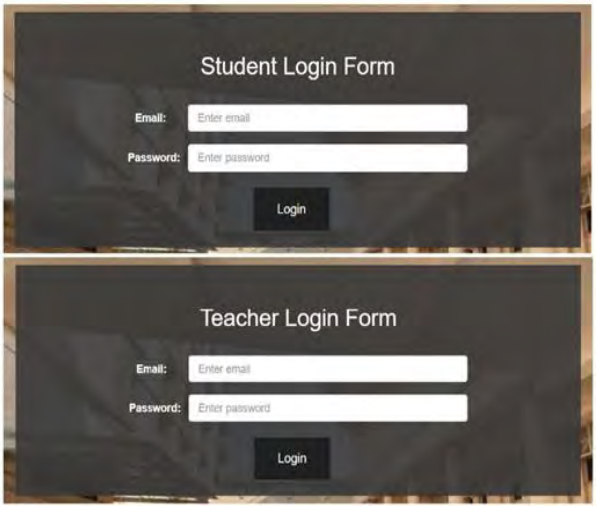


Figure 4. Login Pages

The user passwords aren't encrypted in the database making it a little less secure but that can be implemented in the later updates using MD5.

Figure 5. Select Subject Page

After a student logs in, he/she is to choose a subject class to enter. This page is exclusively for students. It redirects them to the subject classroom they choose.

Figure 6. Classroom Page

[6] The classroom page consists of a live chat box that fetches all previous chats from the database. As all classroom data is kept separate, the classroom messages do not mix with each other. The chat box is equipped to show the name of the user so there is easy identification

VII. SCOPE OF PROJECT

The Project 'Subject-wise Learning Management System' is developed largely on non-proprietary freeware. [5] The project easily meets the need of any school or college that is looking for a dedicated platform to conduct its online lectures and doubt solving sessions. It can handle large amount of unstructured data hence it won't give rise to any performance issue.

To improve on the existing project, we plan to organize the doubts subject wise and then topic wise. If the topic is too large, the concepts can be further divided. The teachers can then pick from the filtered doubts and solve them. There also needs to be an option to allow input of different media files for easier communication of doubts. Passwords need to be encrypted using MD5 encryption/decryption technique to up the security and user privacy.

VIII. CONCLUSION

Social media applications are ineffective for sharing and discussing educational content as they're simply not made for it. It is better to have an application dedicated to the sole purpose of keeping all the learning organized. There will be no concern of privacy because the application is solely for the purpose of learning and will not collect any personal data other than what is required for user identification. The app environment will be optimized for learning and will be very organized. This will be a customized experience for students and teachers to manage the learning data with ease. Anonymous doubts will not be allowed to minimize internet trolls. Student identification through the registration process will be a must. Thus, we successfully built this simple Learning Management

System using MySQL database and PHP data input and retrieval techniques for an interactive website designed using HTML and CSS.

REFERENCES

1. J Learning Management System Technologies and Software Solutions for Online Teaching: Tools and Applications by Kats, Yefim : https://books.google.co.in/books?id=2OsPGIvgjGwC&printsec=frontcover#v=onepage&q& f=false

2. Using the Facebook group as a learning management system: An exploratory study British Journal of Educational Technology by Qiyun Wang Huay Lit Woo Choon Lang Quek Yuqin Yang Mei Liu: https://bera-journals.onlinelibrary.wiley.com/doi/abs/10.11 11/j.1467-8535.2011. 01195.x

3. "WhatsApp, Teacher?" - Student Perspectives on Teacher-Student WhatsApp Interactions in Secondary Schools Journal of Information Technology Education: Research Hananel Rosenberg, Christa S. C. Asterhan: https://www.informingscience.org/Publications/4081?Type=conferenceproceedings&Confer enceID=47

4. Determination of Student Opinions on Usage of Social Media and Mobile Tools in Student-Teacher, Student- Student Communication International Journal of Emerging Technologies inLearning(iJET) Hasan Denizalp, Fezile Ozdamli https://onlinejour.journals.publicknowledgepro ject.org/index.php/i-jet/article/view/11745

5. Online chatting system for college enquiry using knowledgeable database : https://www.static-contents.youth4work.com/y4w/Documents/Po rtfolio/1a269a70-6cb0-4c5d-bd5b- 4549a22d2d10.pdf

6. Chatting System with Displaying Chat History Project https://1000projects.org/online-chatting- system-with-displaying-chat-history-project.html

Design and Development of Website on Major Psychological Issues and Symptoms

Tanisha Singh
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
singhtanisha667@gmail.com

Ria Sinha
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
sinha.riaritu@gmail.com

Sejal Yadav
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
sejalyadav2012@gmail.com

***Abstract*— The internet is widely used source of information for patients searching for medical/health care information. It is generally agreed that social ties play a beneficial role in the maintenance of psychological well-being. Psychological issues and mental health have been neglected in the discourse around health, human rights and equality. In the current pandemic situation, it has affected the well-being of both individuals as well as communities (causing confusion, insecurities, emotional isolation, economic loss, work and school closures, etc.). In India, WHO estimates that the burden of mental problems is of the tune of 2,443 DALYs per 1000,000 population? The economic loss due to mental health conditions is estimated, 2012- 2030, is 1.03 trillion of 2010 dollars. Online based mental health services have the potential to address the unmet need for mental health care. The study method for this particular project was done by visiting similar websites and articles. A website is created namely "Human-Forth" which is the solution to the identified problem. HTML (the Hypertext Markup Language) and CSS (Cascading Style Sheets) are two of the core technologies for building Web pages. The home-page of the website contains major psychological issues and its symptoms, some self-improvement tips, theories behind psychological issues, frequently asked questions, facts and statistics and lastly the about us page. The user can freely visit the website and can also ask any questions regarding the topics through our email-id.**

Keywords*— *Psychological issues, Human-Forth, HTML, CSS.

INTRODUCTION

Mental health includes our emotional, psychological, and social well-being. It affects how we think, feel, and act as we cope with life. It also helps determine how we handle stress, relate to others, and make choices. Mental health is important at every stage of life, from childhood and adolescence through adulthood and aging Accessing mental health websites help an individual understand and recognize mental health difficulties, and to start making the steps towards recovery.

The website includes some major psychological issues in India and its symptoms so that the user can actually understand the disorder through which he/she is going. The self-improvement tips are useful and can work in any kind of psychological disorders. The theories and frequently asked questions can help the user gain more information about the problems. The facts and statistics are included so that one can know the situation of the disorders in our country. Lastly, if the user has any kind of queries/suggestions can always contact us by putting a mail which is mentioned in the about section.

PROBLEM DEFINITION

Currently there are many existing websites which are not providing proper information to the users and just to decrease their bounce rate, they are making users active on their websites. Also, these sites are making bad use of cookies and sharing the user's information with the other sites in order to make profit. These sites also have less security and because of that user's data can be lost. Due to the low speed of the websites these websites are not able to become interactive and user friendly. Due to these issues the user and the website manager both suffer heavy loss due to these issues. Looking towards these issues, a website is designed and developed based on psychological issues and symptoms in India namely, Human Forth, which is interactive and user friendly and the users will not face any issues.

MOTIVATION

Currently there are many existing websites which are not providing proper information to the users and just to decrease their bounce rate, they are making users active on their websites. Also, these sites are making bad use of cookies and sharing the user's information with the other sites in order to make profit. These sites also have less security and because of that user's data can be lost. Due to the low speed of the websites these websites are not able to become interactive and user friendly. Due to these issues the user and the website manager both suffer heavy loss due to these issues. Looking towards these issues, a website is designed and developed based on psychological issues and symptoms in India namely, Human Forth, which is interactive and user friendly and the users will not face any issues.

LITERATURE SURVEY

Mental illnesses were well known in ancient Mesopotamia, where diseases and mental disorders

were believed to be caused by specific deities. Because hands symbolized control over a person, mental illnesses were known as "hands" of certain deities. One psychological illness was known as Qāt Ištar, meaning "Hand of Ishtar". Others were known as "Hand of Shamash", "Hand of the Ghost", and "Hand of the God". Descriptions of these illnesses, however, are so vague that it is usually impossible to determine which illnesses they correspond to in modern terminology. Mesopotamian doctors kept detailed record of their patients' hallucinations and assigned spiritual meanings to them. A patient who hallucinated that he was seeing a dog was predicted to die; whereas, if he saw a gazelle, he would recover. The royal family of Elam was notorious for its members frequently suffering from insanity. Erectile dysfunction was recognized as being rooted in psychological problems.[5]

Ancient Hindu scriptures-Ramayana and Mahabharata-contain fictional descriptions of depression and anxiety. Mental disorders were generally thought to reflect abstract metaphysical entities, supernatural agents, sorcery and witchcraft. The Charaka Samhita from circa 600 BC, which is a part of the Hindu Ayurveda ("knowledge of life"), saw ill health as resulting from an imbalance among the three body fluids or forces called Tri-Dosha. These also affected the personality types among people. Suggested causes included inappropriate diet, disrespect towards the gods, teachers or others, mental shock due to excessive fear or joy, and faulty bodily activity. Treatments included the use of herbs and ointments, charms and prayers, and moral or emotional persuasion. During the Era of Lord Rama (5000-4000 BC), Lord Rama's father died from despondency, illustrating major depressive disorder.[6]

PROPOSED DESIGN

The design basically includes the Homepage having the title as “Human Forth” with a positive quote underneath “It is never too late to be what you might have been.” The navigation bar consists of four different options as issues and symptoms, theories, facts and statistics and frequently asked questions. A button is created which contains self-improvement tips. The issues and symptoms section covers the major psychological issues and symptoms in India, the user will have nine options from which they have to choose a particular disorder to have more insights about the disorder. The Theories section covers the theories of psychological disorders which includes the background, history, philosophy, cognitive psychology and so on are included in this page. The facts and statistics cover statistics of psychological disorder in our country and also some informative and interesting facts. The frequently asked questions section covers all the questions which a user might possibly have with the most accurate answers to have a clear picture on mental health. In the end, we have about us page through which the user can contact us through our e- mail regarding any complaint, query or any kind of suggestions.

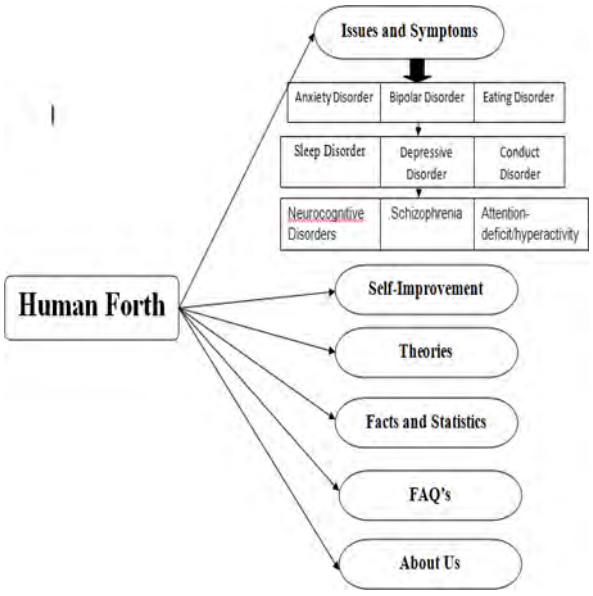


Figure 1. Data flow diagram

Figure 2. Homepage

This is the homepage of the website which consists of a logo on the upper left-hand side and the title named “Human Forth” in the center. The navigation bar consists of issues and symptoms, theories, facts and statistics and frequently asked questions. A button is created which contains self-improvement tips.

Fig 3. Self-improvement

Self-management is intended to empower individuals in their recovery by providing the skills and confidence they need to take active steps in recognizing and managing their own health problems. These are some self-improvement tips which will help the user come up with the disorder. These tips are helpful in any type of psychological disorders.

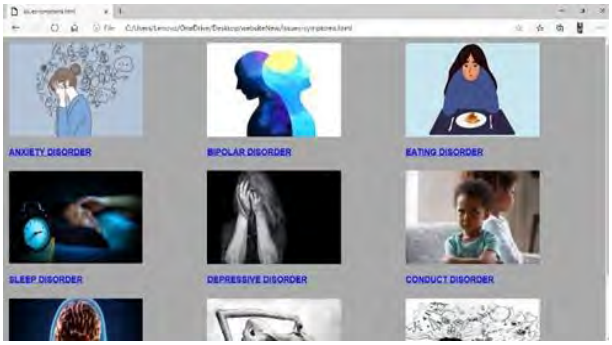


Fig 4. Major Psychological issues and symptoms

This page includes the major psychological issues and symptoms in India (total-9). The user will need to click on a particular disorder to know more about the disorder. If the user doesn't want to know about everything but just one or two particular disorder can access this page without wasting any time.

Fig 5. Anxiety disorder

From the above fig 4.1(c), if the user selects anxiety disorder, he/she will be able to know more information in detail about the disorder. The same goes to every other disorder on the page. It contains different types of anxiety disorder and its symptoms.

Fig 6. Theories

This page contains some theories of psychological disorders. The background, history, philosophy, cognitive psychology, etc. topics are included in this page.

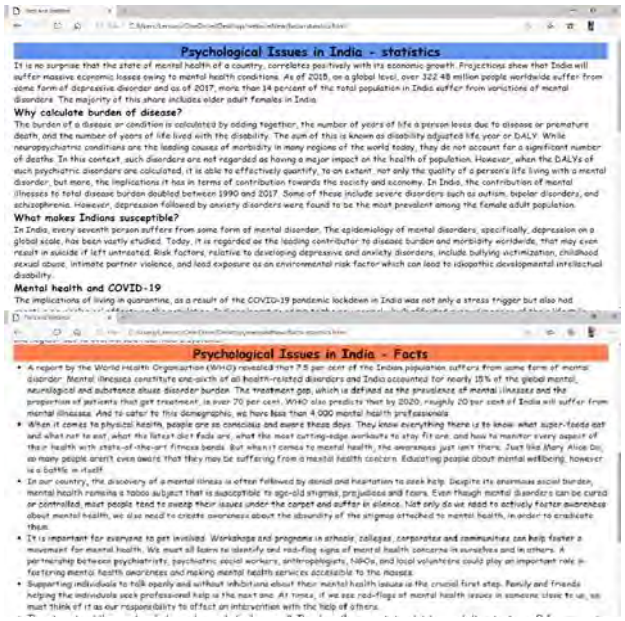


Fig.7 Facts and statistics

This page of the website contains some statistics of psychological disorder in our country and also some informative and interesting facts.

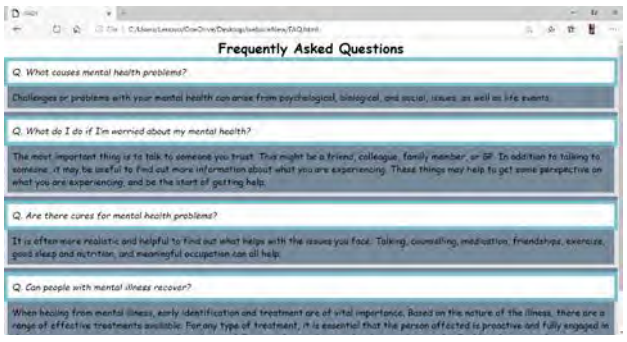


Fig 8. Frequently asked questions

This page of the website contains some frequently asked questions. The user can find the related answers accordingly.

Fig 9. About Us page

Through this page of the website the user can contact us through our e-mail regarding any complaint, query or any kind of suggestions.

SCOPE OF PROJECT

Today, someone who finds themselves anxious or depressed, perhaps due to stressful life events, can easily and affordably take charge of their own mental health or any other disorder at any time, on almost any device using the website. Mental health burden is a major health concern worldwide. In the last few decades, we are witnessing innovations that are successfully addressing gaps in the mental health service delivery in Indian context. This is an opportune time to explore existing innovative mental health initiatives in the country and integrate viable interventions to primary healthcare facilities to strengthen public mental healthcare delivery. Mobile devices are giving the public, doctors and researchers new ways to access help, monitor progress and increase understanding of mental health importance. Rather than replacing clinicians, technology will likely become a partner in modern mental health care, affording clinicians and consumers tools to enhance well-being.

CONCLUSION

Mental health is a major concern worldwide and India is not far behind in sharing this. If we evaluate developments in the field of mental health, the pace appears to be slow. To give a solution to this problem the front-end of the dynamic web application has been successfully completed under Project Based Learning (PBL)-III. It was created using HTML (Hypertext Markup Language) used for creating the web pages, CSS (Cascading Style Sheet) used for designing/styling the website. The website was created for Major psychological issues and its symptoms in India, which will provide information about the disorders as well as self-improvement tips to deal with it. Every member of the team is accountable for the success of design challenge. Someone who finds themselves anxious or depressed, perhaps due to stressful life events, can easily and affordably take charge of their own mental health or any other disorder at any time, on almost any device using the website. The design has been developed in such a manner that it is minimal and efficient, hence taking care of UI/UX. The website is interactive, responsive and user friendly which is most important.

REFERENCES

1. https://www.ncbi.nlm.nih.gov/pmc/articles/P MC5479084/
2.https://digitalsynopsis.com/design/web- design-psychology-create-site-influence- people/
3.https://www.verywellmind.com/
4.https://www.psypost.org/2016/09/top-best- psychology-websites-articles-information- 44974
5.https://en.wikipedia.org/wiki/History_of_men tal_disorders#:~:text=Mental%20illnesses%20were%20well%20known,%22hands%22%20of%20certain%20deities.
6.https://en.wikipedia.org/wiki/History_of_men tal_disorders#India

Laser Based Vibration Sensor Through Mobile

Shalini .J. yadav
Electronics and Telecommunication
Thakur College of Enigenieering and Technology
Mumbai, India
Email: rubyadav2421@gmail.com

Rajan yadav
Electronics and Telecommunication
Thakur College of Enigenieering and Technology
Mumbai, India
Email: rajanyadav2873@gmail.com

Prathmesh yadav
Electronics and Telecommunication
Thakur College of Enigenieering and Technology
Mumbai, India
Email: prathmeshyadav45@gmail.com

***Abstract*—Machine condition monitoring has gained momentum over the years and becoming an essential component in the today's industrial units. A cost-effective machine condition monitoring system is need of the hour for predictive maintenance. The paper presents the design and implementation using vibration sensor, and also this system operated through smartphones. Vibration analysis plays a major role in detecting machine defects and developing flaws before the equipment fails and potentially damages. The concept of this project was to detect faulty equipment in industry machine so that before damaging the whole machine faulty equipment can be replace and improve the durability of machine.**

Keywords—vibration sensor, industrial, smartphone, equipment.

I. INTRODUCTION

Vibration measurement using different signal processing with suitable set-up data is a powerful tool to identify and predict failure. Conducting different Vibration analysis techniques could lead to improve Machine Health and availability. Monitoring the vibration characteristics of a machine can provide the information of its health condition, and this piece of information can be used to detect problems that might be incipient or developing. There are two ways for analysis with contact and without contact here this project is based on non-contact analysis. Non-contact analysis based on laser-based vibration sensor. Usually in the contact type vibration sensing, the sensor is attached to the machines or instruments in order to detect the vibration amplitude and frequency. In some applications where precise vibration measurement is required or in toxic and hazardous environment, addition of contact sensor becomes impractical due to inaccessibility or since this attachment adds a mass on the instrument or the machine and might alter its vibration characteristics. But non-contact analysis very cost effective and uses less manual power also give better results.

In industry, machine monitoring necessary so that every machine can function properly and do not affect the production of plant. This project gives the solution for this problem by checking vibration level of machine if vibration level increases it will give alert so that faulty Equipment can replace on time and production of plant can go on.

II. PROBLEM DEFINATION

This project based on non-contact vibration sensor for monitoring damage in industry machine. There are many industries that have many costly machine and also important working machine. Monitoring machine in industry for avoid failure in machine functioning is very necessary. But monitoring machine through Traditional technique that is health monitoring system is through wired systems formed by communication cables and various types of sensor is very costly and hard to maintain. For reducing that in this we are using vibration sensor also we are making database that include every machine industry details so that if any machine exceeds their permissible limit vibration it can send notification through app to the concern person.

III. IMPLEMENTATION

VIBRATION SENSOR: A vibration sensor is a device that measures the amount and frequency of vibration in a given system, machine, or piece of equipment. Those measurements can be used to detect imbalances or other issues in the asset and predict future breakdowns.

WORKING OF VIBRATION SENSOR: A vibration sensor either connects directly to an asset or monitors it wirelessly. Once placed, it will detect vibrations from the asset through various means, depending on the type of sensor (more on that below). Over time, you'll get two types of data from the device

a) FREQUENCY: The first type of data is the frequency, or how often the vibration occurs. By tracking when spikes in vibration happen in a given asset, you'll be able to pinpoint root causes.

b) Intensity: The second point of data you'll get is the intensity of the vibration as it occurs. The more vibration you have from a piece of equipment, the higher the intensity measurements will be.

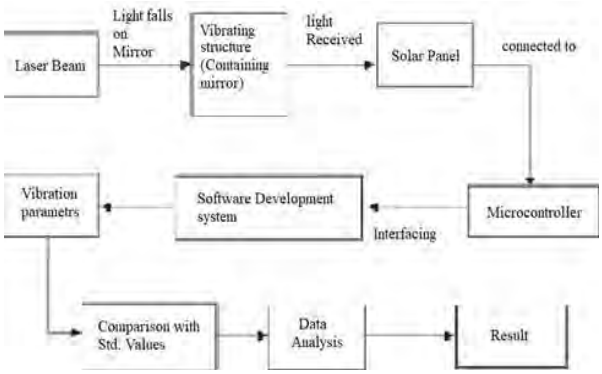


FIG 1.data Acquisition system

In this first laser beam go to the vibrating object then reflecting light goes to the Solar panel after that send vibration data to the microcontroller then microcontroller analyze vibration parameter then it display signals of the machine.

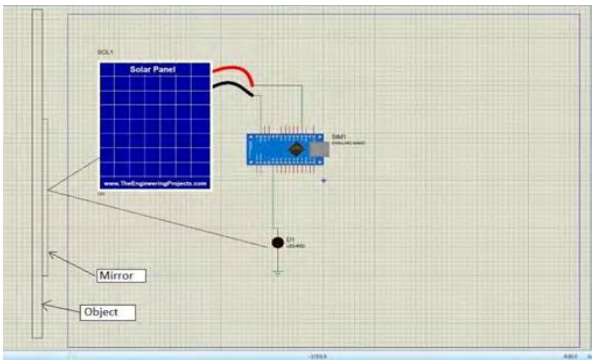


Fig 2. Circuit Diagram

After the data acquisition system is ready, we combine that with software development system.so that it can give result accurately after analysis the data using calibration with accelerometer.

IV. WORKING

A laser source is used to impart on vibrating structure. A mirror will be glued to the vibrating structure so that when laser beam hits the mirror max light is reflected towards the solar panel. As there are many light sources already present in environment so to eliminate unwanted light wavelength there will be a coating of a material that reflects back all other wavelength except the laser beam. So when laser beam hits solar panel there will be different current generation for different co-ordinates. These current readings are processed in microcontroller (ATmega328p). Then in the μC the data is calibrated to compare it with the standard data sheets. If the structure is working properly i.e. vibrations are as expected, than the taking reading continues and if vibration readings exceeds there will some kind error prompt either by LED or notification sent to mobile.

V. EXPECTED OUTPUT

When laser is emitted on target (vibrating structure), it reflects to light sensor. When the reflected light passes from light sensor, reading will be taken. And the light sensor will be connected to Arduino, so all the reading data will be transferred to a mobile app via Bluetooth module, connected to Arduino. List of readings will be recorded and it will be compared to vibration data provided by manufacturer that should not be exceeded while machine is ON. If the vibration exceeds certain limit of vibration, a message will be sent to the operator (mobile, it is connected to). Laser intensity frequency and minimum/maximum limit of vibrations that can be measured will be calculated on further research.

REFRENCE

[1] Armin B. Mehrabi,Saman Farhangdoust“A Laser-Based Noncontact Vibration Technique for Health Monitoring of Structural Cables: Background, Success, and New Developments”, Department of Civil and Environmental Engineering, Florida International University, Miami, FL 33174, USA,2018.

[2] Aseem Singh Rawat, Nitin Kawade “Development of Laser Vibrometer”, Laser & Plasma Technology Division,2 016.

[3] Deepam Goyal, BS Pabla “Development of non-contact structural health monitoring system for machine tools”, department of mechanical engineering, NITTTR , Chandigarh, 3 August 2016.

[4] Suratsavadee Korkua, Himanshu Jain, Wei-Jen Lee, Chiman Kwan” Wireless Health Monitoring System for Vibration Detection of Induction Motors”, Energy Systems Research Center, The University of Texas at Arlington, Arlington, TX 76019,2019

E-Books for Engineering Undergraduates

Shubham Bhatt
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
shubhamsb2301@gmail.com

Aashvi Jain
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
aashvijain225@gmail.com

Priyanshu Jain
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
priyanshuvikasjain@gmail.com

***Abstract*— Our project is based on a simple idea of helping students to get an easy access to the books which they are not able to have due to this pandemic. We are trying to make a user-friendly interface, for example the students can search for the books using either the title of the book or the name of the author. We came up with this idea because even though the educational institutions are not in operation but still there are exams being conducted and thus it gets difficult for students to cope up with the studies without proper study material. Through our website we will try to provide as many books and study materials to the students as possible so that they can use them for theirs study.**

We came up with the idea to provide free books because of this pandemic and also so that the students who cannot afford this book can get it for free. It was a bit of a challenge to find a good way to implement our idea. Getting free books was even tougher as many of the publications do not provide books for free. Even after we got the books making the website was difficult but with the help of our guide, we were able to make the site on time and make it perfectly as we wanted.

Our website is more focused towards easy access of eBooks and it does not need any registering or logging in process and a user can easily download a book from the site without any fee. While making this website we faced quite a few problems but we kept trying and thus website was created.

I. INTRODUCTION

Java is the most widely used technology to design web applications since last decade. It's based on MVC architecture that uses Spring Hibernate ORM framework. While there is no denying that Java is efficient and powerful tool but it cannot meet the everchanging needs and requirements of modern technology. JavaScript has emerged as powerful tool that enables developers to build highly responsive web applications while simultaneously giving them access to powerful libraries to customize their application. Hence, it's important to develop web applications using JavaScript libraries like React and Redux so that website can meet the need of evolving technology and user requirements. The main importance of using ReactJS is its efficient and powerful library that open the possibility to develop powerful websites that can perform even when size of data keeps increasing.

II. PROBLEM DEFINITION

A basic library provides a limited number of types of books. Usually, the library provides hard covered books meant for research, educational purposes, and/or historical reading. The section for leisure reading is limited to certain type of books not always appealing to everyone. Allowing the library to obtain a wide variety of books, both online and in the library, would interest students, teachers, and the community. An increase in quality of educational resources helps create the quality in any type of class instruction and research. Since there exist a limited space in the library to store all these books; online books are the best approach to provide quality to everyone.

III. MOTIVATION

Basically, we were influenced by different online education sites which does help us in understanding stuff. Other than teaching online we can have a website which can contain many different kinds of engineering books to help the students who are studying from home to learn the concepts on their own. Students who feel that they need different books to refer different topics can use this website and have an access to a wide variety of books. According to our survey even students wanted this way of learning as it is easy and feasible for them to study and this website can be helpful to them not only during this time of pandemic but also after the regular classes starts.

IV. LITERATURE SURVEY

The first research that we referred to was done by Mr. Deepak Kumar. In his book "Academic and scholarly usage of e-books" he mentioned about how eBooks are useful for the youth and how they can be used by institutes so that the burden of carrying books can be removed. From this research we understood the need of eBooks.

Exploratory Research: The Effects of Electronic Books on College Students is another classic research paper written by Ya- Ling Chen, Sitong Fan and Zhongyuan He. This Research paper was uploaded on the site of Johnson and Wales University. While referring to study in this paper we got some really important statistical

knowledge about how the students around the world use the electronics in studies and how good eBooks can be for the students.

Even though we had a good briefing of eBooks and its benefits we still were unsure how should we go about our plan how should it be effective. Then we referred to "E-book Reading and its impact on Academic status of Students" by Ali Akbar Khasseh and Ali Biranvand which provided us the final important points and thus were able to use the knowledge to create the website

V. PROPOSED DESIGN

Our project is based on a simple idea of helping students to get an easy access to the books which they are not able to have due to this pandemic. So, we decide to create a website with a very minimal design that is very simple website. A user who may be student or a teacher can easily get to know about website on social media platform and then visit the website. The user can scroll through the branches of the engineering and as soon as he selects any branch, he will be taken to the next page which will contain the books of that branch and then the user can easily download the book it wants and if the user is not able to find a book, he or she can easily contact us by filling a short form at the bottom of the home page and we can get the details of the user and contact the user and provide the user with whatever books he or she wants. So, this is basically our proposed design of our website.

VI. RESULT & DISCUSSIONS

E-books are here to stay and there are no way physical books will vanish in the next decade or so. It is a matter of personal preference whether one likes to turn the pages or swipe right/left to go back/forward. Authors are getting more opportunities now a days through self-publishing model of eBooks on various platforms like Kindle or Matrubharti. India has highest young consumer of Internet and smart devices; such generation prefer eBooks over books.

Many of these young consumers consider reading physical books boring and like reading through internet. Even the eBooks makes the problem of carrying physical books vanish from the world as you can have as many books you want in a single tablet or phone as compared to carrying them physically. Seeing the benefits of eBooks, we are sure that the concept of physical book will be overtaken by the concept of eBooks.

The books which we have uploaded in our website are:

1. Computer Science

   - Arithmetic and Logic in Computer Systems.
   - Computer application for engineering.
   - Computer-Aided Design Engineering and Manufacturing.
   - Design Criteria for Low Distortion in Feedback Opamp Circuits.

2. Information Technology

   - Advanced Software Engineering - Expanding the Frontiers of Software Technology.
   - Advances in Information Technology and Industry Applications.
   - Driver Adaptation to Information and Assistance Systems.
   - Information Technology (IT)-Based Educational Materials.

3. Electronics and Telecommunications

   - Advanced MEMS Packaging (Electronic Engineering).
   - Electronic Engineering.
   - Filter Theory in Electronic Engineering.
   - Surface Acoustic Wave Filters, Second Edition - With Applications to Electronic Communications and Signal Processing.

4. Aerospace

   - Concepts & applications of aerospace engineering.
   - Introduction to Aircraft Structural Analysis (Elsevier Aerospace Engineering).
   - Optimization Techniques - With Applications to Aerospace Systems.
   - PBG based Terahertz Antenna for Aerospace Applications.

5. Electrical

   - Electrical power cable engineering.
   - Electrical power equipment maintenance and testing.
   - Mathematics for Electrical Engineering and Computing.
   - Power Electronic Control in Electrical Systems.

6. Civil

- Analyzing Uncertainty in Civil Engineering.
- Bayesian Methods for Structural Dynamics and Civil Engineering.
- Civil Engineering Formulas.
- Geosynthetics in Civil Engineering.

7. Mechanical

- Elastoplasticity theory.
- Fundamental mechanics of fluids.
- Introduction to contact mechanics.
- Mechanical Alloyingfor Fabrication of Advanced Engineering Materials.

8. Chemical

- Chemical Engineering Fluid Mechanics.
- Chemical Engineering.
- Introduction to Chemical Engineering Analysis Using Mathematics.
- Scale-up in chemical engineering.

The Screenshots of the website are shown below:

Fig 4.1 Home page

Fig 4.2 Contact Us

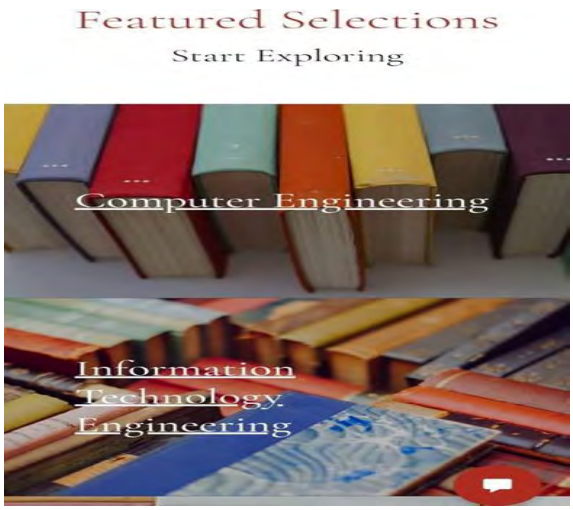


Fig 4.3 List of Branches

Fig 4.4 eBooks For Download

VII. SCOPE OF PROJECT

E-books are here to stay and there are no way physical books will vanish in the next decade or so. It is a matter of personal preference whether one likes to turn the pages or swipe right/left to go back/forward. Authors are getting more opportunities now a days through self-publishing model of eBooks on various platforms like Kindle or Matrubharti. India has highest young consumer of Internet and smart devices; such generation prefer eBooks over books. Many of these young consumers consider reading physical books boring and like reading through internet. Even the eBooks makes the problem of carrying physical books vanish from the world as you can have as many books you want in a single tablet or phone as compared to carrying them physically. Seeing the benefits of eBooks, we are sure that the concept of physical book will be overtaken by the concept of eBooks.

VIII. CONCLUSION

We through our project have tried to implement a small teaching which we are listening since when we were kids and that is “Education should be free for all and is a right to every being”. A student or a teacher which can be available and accessible to all without any restrictions. This website can also be used by institutions at such harsh times of pandemic to provide their students with books so that the students can study from those from the website. Our website can be very helpful to every user who wants to study.

can easily have an excess to a lot of books for free and from anywhere in the world. There are many branches of engineering on which a user can find a book on our website for free of cost. And it can even ask for books which are not available on website by contacting us. Our whole idea was to make a website We really hope that with the help of this website we are able to help people around the country who want to study engineering and make their life better.

REFERENCES

[1] “Academic and scholarly usage of e-books” by Deepak Kumar. https://www.researchgate.net/publication/305772910_ Academic_and_Scholarly_Usage_of_E-Books_A_Study_of_Science_Faculties_of_Kurukshetr a_University_Haryana

[2] “Exploratory Research: The Effects of Electronic Books on College Students” by Ya-Ling Chen, Sitong Fan, Zhongyuan He https://scholarsarchive.jwu.edu/mba_student

[3] “E-book Reading and its Impact on Academic Status of Students” by Ali Akbar Khasseh, Ali Biranvand. http://digitalcommons.unl.edu/libphilprac

Guidelines for E-Waste Management

Gupta Shivam Mataprasad
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
shivam1991432@gmail.com

Kulampurath Sharath Anand
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
sharatha317@gmail.com

Bhunia Mausam
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
mausambhunia123@gmail.com

***Abstract*—Our project is based on making a website on how to reuse the electronic components. In our website's homepage there is a search bar, contact us and join us buttons. The user can search by typing the component's name in the search bar and it will show the options available for that component on how to reuse it.Contact us page is for if user finds any difficulties on site. Join us page allows the user to give ideas. We need to to always remember the 3Rs principle Reduce Reuse and Recycle for the resource management recycling: Our website shows that how to separate components that can be recycled, with a YouTube link provided. Reuse: Our website shows that how to reuse the components and provides a YouTube link. Reduce: This website also promotes to use less e-waste materials so it will cause no harm to our environment. We made this website user friendly so anyone can use it easily and the interface makes it much more easier for the user to use the site the website mainly consist of two parts home and industrial the home section consists of all the small scale products like mobile, table fan, grinder etc. industrial side consist of all the heavy duty machines like motors or tons or cables and wires or battery of car so the solution of the selected product will be provided in form of a YouTube link and the user can reuse, recycle the following device/ component.**

Keywords— Database, YouTube, Reduce, Reuse, Recycle.

I. INTRODUCTION

E-waste is a popular, informal name for electronic products nearing the end of their "useful life." Computers, televisions, VCRs, stereos, copiers, and fax machines are common electronic products. Many of these products can be reused, refurbished, or recycled. There is an up gradation done to this E-waste garbage list which includes gadgets like smartphone, tablets, laptops, video game consoles, cameras and many more. India had 1.012 billion active mobile connections in January 2018. Every year the number is growing exponentially. It is a need in the current situation to dispose this electronic waste in a proper way so we are introducing our project “Don’t throw it away” as a solution for the following problem so the people on industrial and household level will be able to dispose or reuse the following E-wastecomponent or device.

II. PROBLEM DEFINITION

As you would expect, electronic waste (also known as e-waste) refers to discarded electronic devices. This can include items like cell phones, tablets, computers, TVs, or any other electronics that are no longer needed or used by the owner. These old electronic items must be disposed of properly to avoid the damaging effects of e-waste pollution. We’re using (and discarding) more and more electronics. Only a Small proportion of E-Waste is Properly Recycled. Electronics Contain Heavy Metals and Toxic Chemical. Manufacturers Implement ‘Planned Obsolescence’ into Electronics. Toxins from E-Waste Can End Up In Our Food

III. MOTIVATION

The motive of this project is to create an easy way to reuse and recycle E-waste using easy means as we all know as we know Electronic waste is emerging as a serious public health and environmental issue in India. India is the "fifth largest electronic waste producer in the world" approximately 2 million tons of e-waste are generated annually and an undisclosed amount of e-waste is imported from other countries around the world. Annually, computer devices account for nearly 70% of e-waste, 12% comes from the telecom sector, 8% from medical equipment and 7% from electric equipment. The government, public sector companies, and private sector companies generate nearly 75% of electronic waste, with the contribution of individual household being only 16%. So as a result we took the initiative to solve this problem and make an easy way to reuse and recycle this E-waste.

IV. LITERATURE SURVEY

After looking into many research papers and websites related to e-waste management we found out.

There is no proper site for e-waste management for small scale products the only sites can be found are for industrial purpose the use various methods like extraction of the metals and wires from the components and reuse them.

The sites were having nice feedbacks in terms of industrial view but for small scale electronic devices and components there were only YouTube videos so

our project will try to cover theses gaps and will be more efficient.

Also in other sites if the user didn't find any part or the solution to his problem there is no scope for him he has to use another site so our project will cover the following problems and make it an efficient and user friendly site.

PROPOSED DESIGN

"Don't throw away" website is needed because, Ideal recycling services could be provided both at home and in the office where e-waste would be recycled without wasting extra time as well as effort. Because people will adopt different recycling actions in terms of the situation of e-waste. Local e-waste recycling information network design. A city-based e-waste information network such as website and local recycling navigation system would be needed to provide relevant news and information regarding donations, recycling locations and professional recycling instructions, so people know how and where to dispose or donate their e-waste

Home page:

The home page was made simple and user friendly so that anyone can use the site easily. The home page consists of main function that is Home, Categories, about us, Contact us which will take the user to the following page. The home page also have a search bar from which the user can input the following component and get it directly. Also the background of the site gives the feel to the user that this site is trying to promote green environment the website also have an "Our products" page in which the company can also sell their products made out of E-waste.

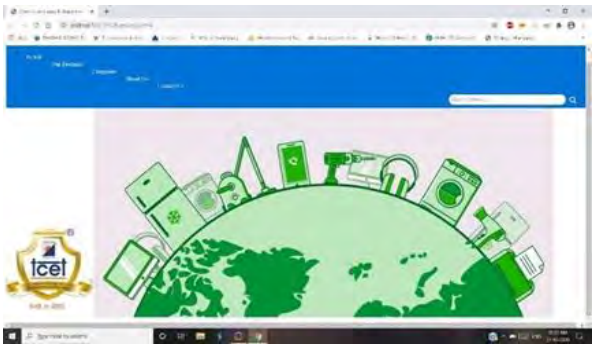


Fig.1 Home page

Categories page:

The page is redirected when the user press the "categories" option and till now we only have two main categories So after the user press home category he/she will be redirected to a page where they can find the components used in home like phones, grinder table fan etc. The industrial section consists of all the large scale machines and components which are used in large scale .After clicking the option shown the user will be redirected to YouTube where the user can learn how to reuse/dispose the following E-waste component or device

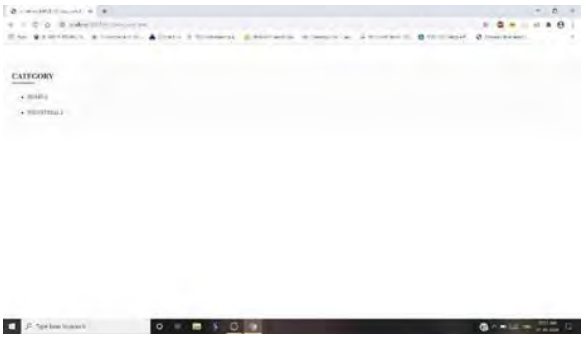


Fig.2 Categories page

Categories (home & Industrial):

So in the figure you can see how the page looks after you click the following section. The YouTube link is provided below of every result with an image so the user can see what the content is in the following link. It is just a base so currently it only have 6 results in each section which can be updated later. The videos provided for the following are very safe and the methods provided are very easy hence the user can reuse and recycle the E-waste easily.

Fig.3 Categories home

Contact us page:

The contact us page is where the user has to go if he/she doesn't found the desired product or solution A form will appear in the con tact us section where the user has to input his/her email and the problem they faced. It will get stored into the database and then the following product/solution will be added by us and a email will be reverted back to the user that their desired product or solution is now available. Thus the website will be efficient and can be updated accordingly.

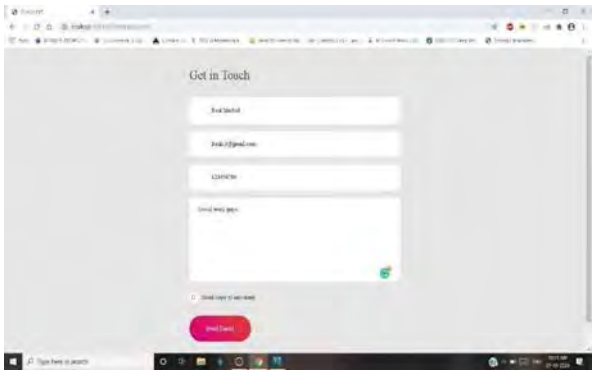


Fig.4 Contact us page

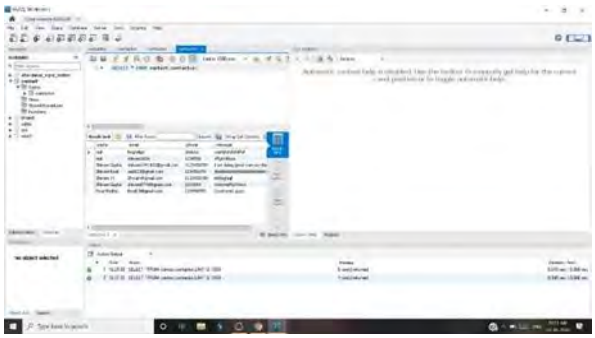


Fig.5 Database

The contact us page is where the user has to go if he/she doesn't found the desired product or solution A form will appear in the con tact us section where the user has to input his/her email and the problem they faced. It will get stored into the database and then the following product/solution will be added by us and a email will be reverted back to the user that their desired product or solution is now available.
Thus the website will be efficient and can be updated accordingly.

RESULT & DISCUSSIONS

Most of the electronic gadgets are large and small household appliances. From our own experience, it became difficult to find a person to repair the household articles and the cost for the repair is really a big problem for the common people. Showrooms and shops selling household appliances can attach a repairing center with them to repair the article. They can also think about home service.

Causes:-

- Rapid growth of users of computers and other technology devices.
- Disposal of technology devices is not an easy task, as they contain hazardous materials.
- Average lifespan of electronic devices is decreasing as people are updating their houses with new electronic devices.
- transferring e-waste from developed countries to developing countries in the name of donations.

Effects:-

- Resources are wasted as valuable materials in e- waste are being dumped in normal wastage.
- Toxic materials in e-waste cause severe health risk.
- Environmental damage.
- Land filling of e-wastes can lead to the launching of lead into the groundwater.
- The cadmium from one mobile battery can pollute 600 m3 of water.
- Informal recyclers are attracting the poor people in the name of employment and making them disassemble the components with bare hands and without any precautions, which is highly dangerous for their health.

SCOPE OF PROJECT

E waste recycling system is future to reduce the electronic waste and reusability of the electronic material in future. The E-waste collection system that develops the information about the recycling and problem affect by them. According to the research, more than 20m Electronic gadgets are connected to each other with the help of IOT, which will further increase by more than 50m by 2020.It will help to decrease the E-waste from the world and eventually there will be less production of Electronic products and more recycling of the material. In India, Rag pickers are known for collecting the various types of wastes which also includes E-waste for selling them to earn their livelihood. These Rag pickers are said to be unskilled and uneducated people who are unaware of the dangerous effects caused by burning e E-waste in open air .So we will be providing sufficient information and video assistance so that they do not hurt themselves or cause more pollution. India being developing country, more than 60% of the population lies under Middle/Lower Middle Class. These peoples are unable to buy or purchase various types of Electronic products. So if we recycle and re-use the E-waste, we can sell the re-cycled products cheaper than its actual cost and therefore they can buy these products.

CONCLUSION

Despite the various new technologies that are emerging for solid waste disposal, landfilling still remains the most common solution in the northeastern Illinois region. The establishment and closure of landfills could pose a potential hazard to groundwater, due to leachate seepage, and air quality due to gases released. Unless

proper maintenance and management is sustained for a fairly long time (30 years), public health may be compromised as a result. Such management is costly and potentially dangerous if faulty. Thus, a safer and more sustainable approach may be minimizing the number of landfills constructed and ensuring their longevity so as not to continue taking viable land for waste disposal. It is therefore critical to divert waste from landfills through reduction and recycling. There seems to be significant awareness of the importance of recycling in the region, however not all communities have curbside collection at single and multi-family homes, specifically in the unincorporated areas. Generally, businesses in the region do not have a mandate or incentive to recycle other than consumer appeal which does not necessarily prompt them to burning of unacceptable wastes has been listed by several solid waste professionals in the area whom we surveyed. Although these experts are in consensus that partake in these activities. Open/illegal dumping and landfilling waste is the most economical disposal method, they also agree that more recycling and resource reduction should be attained to reduce the continuous need for landfills. That said, not all counties have recycling ordinances, the main reasons being political opposition and lack of funding for personnel to propose, monitor and enforce regulations. The various counties and municipalities will have to collaborate to reach a comprehensive solution that addresses solid waste disposal regionally.

REFERENCES

[1] Georgios Gaidajis," E-waste: Environmental Problems and Current Management", 2010
[2] Lenny Halim," E-Waste: Current Research and Future Perspective on Developing Countries", 2020
[3] Sivakumaran Sivaramanan," E-Waste Management, Disposal and Its Impacts on the Environment", 2013
[4] http://wasteportal.net/en/waste-types/e-waste
[5] Jugal Kishore," E-Waste Management: As a Challenge to Public Health in India",2010

Environmental Awareness (Forest Conservation)

Anuj Vishwakarma
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India

Yash Rai
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India

Vaibhav Upadhyay
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India

***Abstract* — The Environmental issues are a major global problem of important concern. Due to increasing human population and developments in every sector, the environmental related issues are multiplying in recent years with a diversity of problems focusing the ultimate need for alternative sustainable technologies to safeguard our mother nature. The human's desire for modern technologies and changing lifestyle patterns pose serious threat to the environment and due to the fact, the pollution levels are alarming day by day. In order to achieve sustainable and equitable developments, it is so significant to choose policies and programmes that support efficient use of resources and implement technologies which show the way to reduce the environmental damage, thus resulting in sustainable development. Dedicated To The Protection And Wellbeing Of Forests.**

Keywords — Forest, Nature, Environment, Tree,

I. INTRODUCTION

Environmental awareness is to understand the fragility of our environment and the importance of its protection. Promoting environmental awareness is an easy way to become an environmental steward and participate in creating a brighter future for our children.

II. PROBLEM DEFINITION

Environmentalism is an ideology that evokes the necessity and responsibility of humans to respect, protect, and preserve the natural world from its anthropogenic (caused by humans) afflictions. Changes in Soil: Loss of nutrients in the soil that are derived from breakdown of tree leaves. Loss of biodiversity: Animals and plants that are unable to grow outside of a forest environment face extinction Climate change: Increased greenhouse gases (such as carbon dioxide) present in the air cause climate change if trees are not available, they won't absorb them resulting in Global Warming and this causes Forest fires.

III. MOTIVATION

Humans have a moral obligation to protect the environment and promote the sustainable development of the planet for future generations. Environmental degradation is detrimental and is jeopardising the long-term health and security of animals, plants and humans. Now more than ever, it is important that we understand the impact our actions have on the environment. In order to become more environmentally aware, we also need to take measures to protect the planet and hopefully undo some of the damage already caused by human activity. Behaving in a more environmentally conscious manner can be as simple as making minor changes to your lifestyle. Individuals affect the environment in a variety of ways including pollution emission to land, air and water, use of natural resources, energy consumption and waste.

IV. LITERATURE SURVEY

Environmental Awareness is a cross curriculum topic promoting global awareness, sustainable living and active citizenship. It involves a structured and planned process that seeks the implementation of environmental curriculum at educational institutions at different levels (elementary school, high school, university, graduate and postgraduate levels). Cross-cutting subjects that are integrated in a global perspective but that can be learned and applied locally should implement this curriculum. Based on these principles we might assert that Environmental Awareness should be multilevel and continuous. A first educational level should target special programs for non-formal adult and community-based audiences. The second level focuses on secondary school. It involves teaching the main disciplines within an environmental context. The third level focuses on obtaining environment based professional skills within the different professional disciplines. An urgent need to educate humankind on conservation and sustainable uses of natural resources through environmental education has been accepted as a global necessity. The concept of environmental education gained great momentum at the UN conference in Stockholm in 1972. In Agenda 21 a holistic view of EE was adopted and acknowledged by 175 countries at the first UN Earth summit in Rio de Janeiro on environment and development. The now famous "Agenda 21" identifies education as a vital aid to support all the needed changes for sustainability to take place. Signatory nations agreed to pursue actions to include environment-sustainable development as a cross cutting matter in curriculum at different levels of education, and also to ensure it reaches different audiences, including those located at remote communities. As Smyth (1995) lays it out, "Agenda 21 signals the need for a clear lead from the top and for facilitation of collaboration between the main interests concerned, in national and local government, government agencies, formal education, the business sector, cultural, community and youth organizations and the voluntary sector. All of these are concerned in different ways with direct educational activity and

services, whether formal or informal, with staff training and with exemplary environmental practice and there is an often unrealized potential for collaborative programs." The main goal of Agenda 21 is that all signatory countries incorporate EE into their educational systems at all levels. Norway and Malta represent two examples of countries that are trying to implement environmental curricula in their educational systems. They have both experienced difficulties but they have also made progress. Their efforts deserve analysis because they demonstrate many positive aspects that can be applied elsewhere if locally adapted (19).

V. PROPOSED DESIGN

Environmentally aware design aims to convert global socio-environmental concerns to investigate ecological principles and interactions with design decisions, which determine levels of sustainable usage of environmental resources. The aim of this study is to analyze the changing role and responsibility of designers and the importance of environmentally aware design education as crucial factors to acquire knowledge through the viewpoint of sustainability. The outputs and findings of the workshop conducted with design professionals and educators will be analyzed to consider the obstacles and fundamentals of sustainable design education for developing countries to create environments, buildings and products in a sustainable way.

VI. RESULT & DISCUSSIONS

Formulating strategies for unifying people to initiate the saving of the environment. Saving the environment is a collective responsibility that requires cooperation and collaboration from organizations, societies, governments and individuals so that an effort is realized. Global calls should be made so that the project to save the environment is initiated as a whole. Proper handling of waste materials should be done so that pollutants do not end up in the environment. The policy of recycling and reusing the recyclable and reusable wastes is a good way to save the environment. Another strategy is effective planning of the cities according to the resources that are available. Cities that are unplanned end up in environmental crises because the population might rise beyond what the environment can support. Also, crowding causes environmental pollution because there will be clearing of natural trees in order to build houses for people to live in. Supporting environmental programs by participating in activities aimed at saving the environment is another way to save the environment.

Change should be embraced with regard to environmental conservation e.g., the ban of plastic bags and bottles should be respected. In agriculture, it is recommended that organic fertilizers have to be used in order to minimize the amount of chemical washouts that end up in water bodies. Planting of trees should be encouraged so that air pollution effects can be reduced because trees will replenish the air quality in the atmosphere and save the environment. In the words of Margaret Thatcher, "No generation has a freehold on this earth. All we have is a life tenancy- with a full repairing lease."

VII. SCOPE OF PROJECT

The scope of environmental studies is very wide and it deals with many areas like i) Conservation of natural resources, ii) ecological aspects, iii) pollution of the surrounding natural resources, iv) controlling the pollution, v) social issues connected to it, and vi) impacts of human population on the environment. Ecosystem is a part of the natural environment consisting of a community of living beings and the physical environment both constantly interchanging materials and energy between them. It is the sum total of the environment or a part of nature

VIII. CONCLUSION

So to save the environment, one needs to be prepared to put in the best of efforts. It is the cumulative effort over a collective period of time which can help the environment heal again. Living in a safe environment goes beyond the actions mentioned above. The extent of one's involvement cannot be exhausted to one single effort. However, if one stays conscious of the environment and does not relent in taking steps that make the pro-environment world a better place. The environment needs to be saved because it is the source of life and living things are dependent on it.

REFERENCES

[1] Johnson, D. L.; Ambrose, S. H.; Bassett, T. J.; Bowen, M. L.; Crummey, D. E.; Isaacson, J. S.; Johnson, D. N.; Lamb, P.; Saul, M.; Winter- Nelson, A. E. (1997).

[2] "Meanings of Environmental Terms". Journal of Environmental Quality. 26 (3): 581–589. doi:10.2134/jeq1997.00472425002600030002x. Symons, Donald (1979).

[3] Joe Buchdahl. "Atmosphere, Climate & Environment Information Programme". Ace.mmu.ac.uk. Archived from the original on 2010-10-09. Retrieved 2013-03-09.

[4["World's Space Agencies Unite To Face The Climate Challenge – ISRO". www.isro.gov.in. Retrieved 2019-12-10.

[5] "Why The Amazon Rainforest Is So Rich In Species". Sciencedaily.com. 2005-12-05. Retrieved 2013-03-09.

[6] "The WILD Foundation". Wild.org. Archived from the original on 2012-12-04. Retrieved 2013-03-09.

Hospital Management System

Sarvesh rane
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology Mumbai, India
sarveshrane431@gmail.com

Abhishek Sakpal
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology Mumbai, India
abhisakpal0510@gmail.com

Meet shah
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology Mumbai, India
meetshah8975@gmail.com

***Abstract*— The purpose of the project entitled as "HOSPITAL MANAGEMENT SYSTEM" is to computerize the Front Office Management of Hospital to develop software which is user friendly simple, fast, and cost effective. It deals with the collection of patient's information, diagnosis details, etc. Traditionally, it was done manually. The main function of the system is register and store patient details and doctor details and retrieve these details as and when required, and also to manipulate these details meaningfully System input contains patient details, diagnosis details, while system output is to get these details on to the screen. The Hospital Management System can be entered using a username and password. It is accessible either by an. Administrator or receptionist. Only they can add data into the database. The data can retrieved easily. The data are well protected for personal use and makes the data processing very fast.**

Keywords*— *Database, Firebase, JavaScript, Web application, UI.

I. INTRODUCTION

Any company willing to achieve maximum success in its industry should have its own online representation. And healthcare organizations are no exception to this rule.
A medical web resource plays a significant part: it affects the reputation of the clinic, the effectiveness of treatment, and much more. However, a few questions remain... how to create an appealing hospital website design? Can your platform be profitable? How to make your website work in full force? Let's consider these and other issues in order of importance.

II. LITERATURE SURVEY

The website will give us information of hospital and facilities provided by them. In this current pandemic situation this website will be very helpful for patient to contact with hospital. After referring lots of hospital's web pages we are able to make our website user friendly. One of the main reason of having good hospital website is the fact that it is the first impression for hospital so it's important to make a user friendly website. The use of digital marketing helped the healthcare services in creating band awareness and thus more interest of the patients in their healthcare service.
We gathered data through thorough analysis of 8 hospital's website after that we add features in website. Website has features like login page for patient, online appointment of system, information about doctors, bill management system. This web site will help us to find the right health provider to get treatment. It also includes medical records such as test results and health information.

III. PROPOSED DESIGN

The proposed design is based on minimalist approach to UI/UX. The front end is designed in such a manner that users won't face any kind of difficulty in locating the options. The proposed system uses features of React JS library that are open source.

It incorporates CSS design and Material UI features to provide aesthetic to the web application. While the project will be designed on free cloud storage that is offered by Firebase but to convert it into large-scale, a client will be required to purchase the cloud storage as per cost determined by Firebase Inc. As the number of users increase, the amount of data to be stored, processed and update will increase tremendously. Hence major chunk of cost involved in project will be purchase of cloud storage.

The basic approach was to design the front end in such a manner that it supports good UI/UX simply by help of open source technology. The cost of project increases when length of code increases i.e. human resource utilization is more. This was taken care by using React

JS library that reduces the length of code and still supports development of powerful dynamic web applications. ReactJS being open source further eliminates the cost of production and design. It uses CSS based on Material UI to give aesthetic UI to the user.

The major objectives involved in project planning are listed as follows -

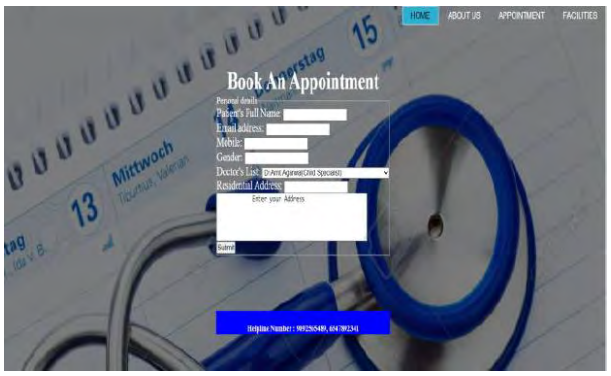
- The front end should be designed in a minimalistic approach such that database can be designed on basis of that without doing any kind of alteration in front view.
- The front view should be based on open-source tools hence only human resource cost should be involved in development. iii. The front end should be efficient to handle user interaction with backend.

Figure 1. Data flow diagram

IV. RESULT & DISCUSSIONS

Taking into account all the mentioned details, we can make the conclusion that the hospital management system is the inevitable part of the lifecycle of the modern medical institution. It automates numerous daily operations and enables smooth interactions of the users. Developing the hospital system software is a great opportunity to create the distinct, efficient and fast delivering healthcare model. Implementation of hospital management system project helps to store all the kinds of records, provide coordination and user communication, implement policies, improve day-to-day operations, arrange the supply chain, manage financial and human resources, and market hospital services. This beneficial decision covers the needs of the patients, staff and hospital authorities and simplifies their interactions. It has become the usual approach to manage the hospital. Many clinics have already experienced its advantages and continue developing new hospital management system project modules.

To improve the quality of life of people in all sectors of our society, so it is inevitable to adhere to this dizzying technological career. Currently, clinical and administrative management of hospitals and health centers is possible through a single platform, with the support of cutting-edge technology, developed to optimize the processes that allow the operation of organizations dedicated to treating patients in any branch of the medicine.



Hospital management systems allows us the ability to optimize and digitize all the processes within the institution, which will help to improve customer service, reduce process costs, streamline the search of medical records, bills, patients, doctors, etc.; thus, having a database of each module implemented.

SCOPE OF PROJECT

Daily functions like patient registration, monitoring blood bank, managing admission and overall management of various departments can be easily performed with higher accuracy after the installation of hospital software. The modules of hospital management software are user-friendly and easy to access. It has a common user friendly interface having several modules. The officials can utilize these modules in their processes without any hassle and make the best possible use of hospital management system. Since, every hospital has some or the other points of worth those vary in comparison with to its competitors. Hence, most of the IT companies give on-demand solutions or feature of customization. It further implicates that hospital information management software can be customized by specifying personal requirements of the campus.

V. CONCLUSION

Taking into account all the mentioned details, we can make the conclusion that the hospital management system is the inevitable part of the lifecycle of the modern medical institution. It automates numerous daily operations and enables smooth interactions of the users. Developing the hospital system software is a great opportunity to create the distinct, efficient and fast delivering healthcare model.

Implementation of hospital management system project helps to store all the kinds of records, provide coordination and user communication, implement policies, improve day-to-day operations, arrange the supply chain, manage financial and human resources, and market hospital services. This beneficial decision covers the needs of the patients, staff and hospital authorities and simplifies their interactions. It has become the usual approach to manage the hospital.

Many clinics have already experienced its advantage and continue developing new hospital management system project modules. The hospital system software is a great solution for any medical institution. If you have some ideas and need the assistance, you are welcome to contact us. We are an outsourcing company with great expertise in software development and always ready to find out the best approaches for your company. If you have any questions, feel free to contact us via the contact form or start the discussion in the website chat widget. we will be glad to provide professional consultation and find the solution for you.

REFERENCES

1. Whitten, Bentley, and Dittman. 2004. System Analysis and Design Methods (5th ed). McGraw-Hill: New York, NY.
2. PerlScriptsJavaScripts.com. 2006. “MySQL Tutorial, Database Commands, Beginners Guide”. http://www.perlscriptsjavascripts.com/tutorials/mysql/index.html.
3. Accessed 2/3/06.
4. HTML Elements. W3schools. Retrieved 3/16/15.
5. CSS Introduction. W3schools. Retrieved 3/16/15.
6. Xhtml.com. Retrieved on 5/16/12.
7. MySQL: Project Summary. Black Duck Software. Retrieved 9/17/12.
8. PHP Manual: www.php.net
9. PHP for Windows: php.net. Retrieved 10/29/13. https://wikipedia.org/wiki/PHP
10. https://wikipedia.org/wiki/HTML
11. https://wikipedia.org/wiki/CSS

This page is kept blank intentionally

Design and Develop A Database For Comparison of Various Automobiles

Atul Kumar Tiwari
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, India
atulktiwari310@gmail.com

Jatin Tak
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
jatintk123@gmail.com

Gaurav Yadav
Department of Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
yadavgaurav490@gmail.com

***Abstract* — When an individual consider of buying a car,there are many aspects that could affect his/her decision on which type of car he/she is interested in. Factors such as the prize, the regular maintenance, comfort and safety are few vital issues that we need to consider. Car evaluation data base is very important structural information that some one should look at for the features and classification of each car could be helpful in our decision making. Because of its underlying concept structure, this data base is very informative, particularly useful for testing practical training and structure discovery methods. This data base classifies car sspecifications according to PRICE,COMFORT, and SAFETY.**

Keywords - work environment, Arduino-UNO, RFID reader EM-18, Staff availability.

I. INTRODUCTION

The main aim of this project is to construct a staff room management system with minimizing the limitations of existing method and also enhancing the privacy level of the staff members which hindered in previous existing systems. The staffroom management system will provide an interface and means through which visitor can get know about the staff members present in staffroom. So basically, this project focuses on the availability of the staff members within their allocated office space. In the survey conducted, few papers on design and implementation of an automatic staff availability tracking system have been studied thoroughly and analyzed to understand the various technologies used for web applications such as html, java, php [1]. After studying the IEEE papers and other technical paper we got an idea about the use of RFID and its implementation and using it in a way which doesn't hinder privacy of the staff members [2]. Apart from research papers other sources from internet were used to understand the previous developments in the field of staff availability-based. Using this information to design a system that can provide with different functionalities. The staffroom management system focuses on maintaining the work environment of the staffroom. Maintaining the work environment of the staffroom is very important as many important works is carried out by the staff members and also to provide visitor with details of the staff member so that student time can be saved. Using RFID tags to detect the presence of staff members in staffroom, provide information to visitor about presence using LCD touchscreen, and interactive user interface for visitor [2]. This system is not only helpful but worthy to implemented. The staffroom management system can used in schools, colleges and in universities. This system can be installed outside the staffroom so, the visitors can get information about staff members present in the staffroom and to maintain work environment of staffroom.

The system is aimed at reducing the amount of time that students, visitors and faculty members spend looking for specific employees without being hindered by the ethical issues surrounding RFID based staff tracking. It focuses on the availability of the staff members within their allocated office space [1].
This work introduces a new method of monitoring student attendance using Radio Frequency Identification (RFID) based on the Internet of Thing (IoT). This proposed project gives idea about interfacing of RFID and IoT in our case we are going to interface RFID reader EM-18 using Arduino- UNO [2].

•The staffroom working environment won't be disturbed
by continuous arrivals of visitors/students.
•Students/visitors can easily get the details of the concerned staff members available in staffroom, thus saving their time. There are many systems available for tracking staff members.
•A good percentage of them involve personal wearing RFID tags that are scanned when move from one building to another building. This has brought about ethical issues regarding privacy of staff members as they were tracked continuously, so this issue is also solved [1].

Maintaining work environment of staff room is very important as teachers and other staff members have many other responsibilities apart from teaching such as maintaining students record for particular semester, preparing marksheets and many other important works. And getting disturbed frequently may

lead to some serious mistake for example if marks of student is wrongly got entered due to frequent disturbance caused due visitors. So, to overcome this problem we have proposed a Staffroom Management System which will help in maintaining staffroom work environment by providing list of staff member who are available inside the staff room outside the staffroom itself and even staff members will be informed about the visitors or students.

II. FEASIABLITY STUDY

After thorough of various research papers and reports on different system based on Raspberry-Pi and other component, we got clear view for our project such what language and software we have master so that we proceed with our project. Our Project would provide visitors the details of staff member available in the staffroom, so that they should not disturb the work environment of the staffroom, thereby providing details of visitor to staff member sitting inside the staffroom. Market potential of this system is very high. In India, there are 789 universities, 37,204 colleges and 11,443 stand-alone institutions. If this system is integrated in universities and colleges, market is huge. Hurdles: In college staffroom managing the large crowd of visitors is a problem. Because normally in college's break is of 30 to 40 minutes and at that time majority of people gather around the staffroom to solve the doubts and queries due to low speed of system it can cater one student at time. Due to which very less queries will be solved. So, use of IoT and web technologies speed of the system can be improved. Man, hours required will be about 300 hours for development of project, testing, analysis, user manual, report. If product is developed with full integration on a single PCB, with all sensors and modules as an integral part of system, cost can be reduced. Procurement of material in mass scale will also reduce overall cost. Product selling price will be based on market conditions and availability of other products in this field at the time we introduce it in market. Other things to consider are the geographic influence on the market, demographics, analyzing competitors and more.

III. PROPOSED SOLUTION

We are going to make use of Arduino-UNO and RFID for hardware implementation of Staffroom Management System. Our proposed system is demonstrated with help of diagram shown in fig. 1

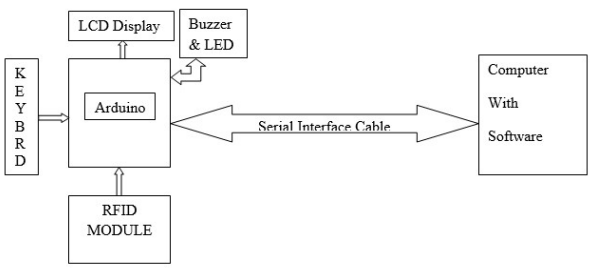


Fig. 1. Basic diagram of Staff room management system

Software on Computer will contain details of staff present in Staffroom. Software will also contain form for student to fill his details for meeting staff in staffroom. Student will put his details in software viz, his name, branch and to whom he wants to meet. This information will be transferred through serial cable to Arduino based system.

Arduino based system will contain a RFID module. A Staff who enters or exits the Staffroom has to show his ID Card at the RFID module. If card is valid, He / She is allowed to enter. Otherwise, there would be alarm on Buzzer and LED will Blink. Staff members present in staffroom will be detected using RFID and Arduino.

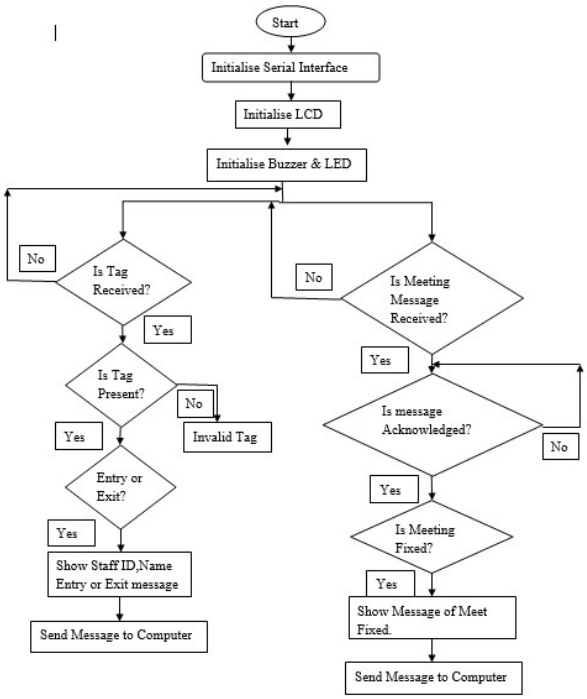


Fig. 2. Arduino system flowchart

A. Hardware implementation:

a) Arduino – UNO:

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits.

b) RFID Reader EM-18 and Tag:

EM-18 is used like any other sensor module. First, we choose the mode of communication between MODULE and CONTROLLER. Next, we will program the controller to receive data from module to display. Next power the system. When a tag is brought near the MODULE it reads the ID and sends the information to controller. The controller receives the information and performs action programmed by us.

c) LCD 16x2:

Alphanumeric LCD display module, meaning can display alphabets and numbers. Consists of two rows and each row can print 16 characters. Each character is built by a 5×8- pixel box. The 16x2 LCD is interfaced with Arduino to display different messages at teacher's side.

A Liquid crystal display is a form of visual display used in electronic devices, in which a layer of a liquid crystal is pack in between two transparent electrodes. We are using basic-generic 16x2 liquid crystal display (i2c bus module version) with an Arduino.
Each I2C bus consists of two signals: SCL and SDA. SCL is the clock signal, whereas SDA is the data signal. The current bus master generates clock signal; some slave devices require more time to prepare data before the master attempts to clock it out. This is called "clock stretching" There is a inbuilt PCF8574 I2C chip that converts I2C serial data to parallel data for the LCD display in I2C module.
These modules are currently come with a default I2C address of either 0x27 or 0x3F. To find version, check the black I2C adaptor board on the underneath of the module. If there 3 sets of pads labelled A0, A1, & A2 then the default address will be 0x3F. If there are no pads the default address will be 0x27. This module has a contrast adjustment pot on the bottom of the display. This may require modifying for the screen to display text properly. It has total of 20 male pins. Out of which 16 pins are faced to rear side and 4 pins faced towards front side. The 16 pins for connect to 16x2 LCD and the 2 pins out of 4 pins are SDA and SCL. SDA is the serial data pin and SCL is the clock pin.I2C Module has POT on it. We can control the variance of the LCD display by revolving this POT. And there is a jumper fixed on the module. When we remove the jumper, the backlight of the LCD display will go OFF.

I2C CharacterLCD	Arduino
GND	GND
VCC	5V
SDA	A4
SCL	A5

Fig. 3. I2C LCD Connections

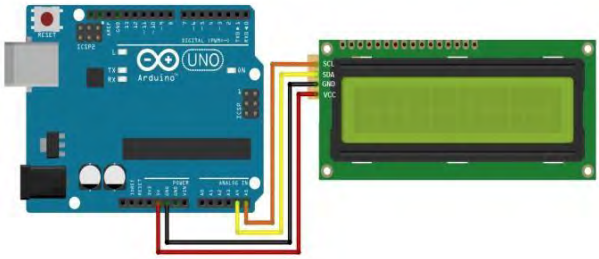


Fig. 4. Arduino-Uno and LCD 16x2 Interface.

In RFID systems, a tag is a tiny silicon chip plus an antenna. The tag can be mobile or static. It is scanned by stationary or mobile readers using radio waves. The microcontroller is an integrated circuit or a chip with a processor and other support devices like data memory, I/O ports, a serial communication interface, etc. which all integrated into one board [2]. We use RFID EM-18 reader to interface with Atmega328P [2].

Fig. 3. The Hardware Interface [2].

Figure 2 shows the hardware interface of Atmega328P Microcontroller and MFRC522 RFID Reader. Figure 3 shows the flow chart for reading the tag and sending it to the Local machine.

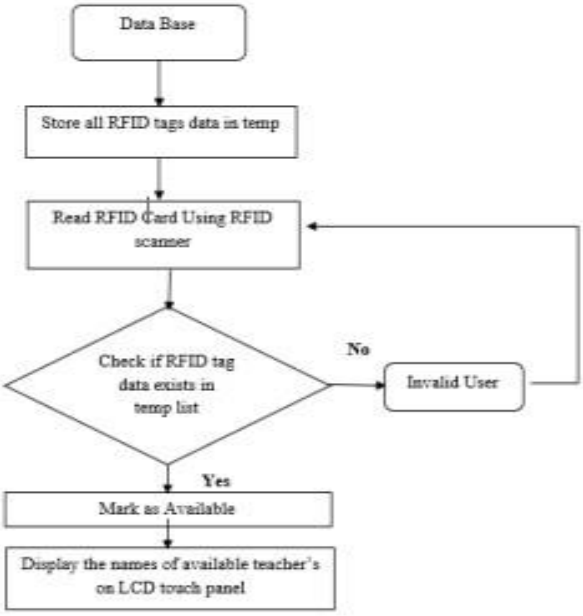
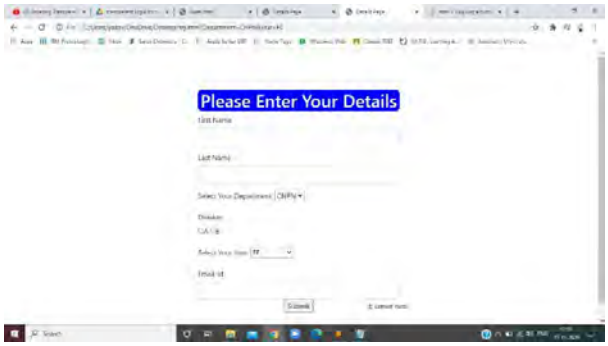


Fig. 5. Flowchart for reading RFID data.

B. Software implementation
The Login page at student side is developed using HTML and CSS. The proposed framework will include aspects of engineering from data collection and aggregation, analysis, data processing, profiling, classification, to hardware modelling, simulation, and integration [2].

IV. RESULT

The system is simple and flexible for the users because it has a simple window. Figure (below) shows the login window which will be at the student side it will be containing different sections which will be used for taking students/visitors details.



V. CONCLUSION

Our goal is to develop an easy to use, efficient and ready to deploy RFID-based staff availability system.
The system provides a practical and efficient solution or maintaining work environment and providing names of faculty present within the office space to visitor thus saving the visitor's time.

The proposed staff availability system uses the concept of Arduino and RFID interfacing for showing the faculty members name on local machine present outside the staffroom. For future work, we would also like to give access to students about faculties present in staffroom on their mobile phone and also to teachers so that they can know about visitor directly on phone using IoT, so that multiple queries can be catered at one time.

REFERENCES

[1.] Kyle Stone, Jan Spies,"Design and Implementation of Automatic Staff availability Tracking System", IEEE Transactions on communication and security, pp 1-3, Dec 2015.

[2.] Soumil Nitin Shah,Abdelshakaour Abouzneid,"IoT Based Smart Attendance System (SAS) Using RFID", IEEE transactions on Applications and Technology Conference, pp. 1-6, Aug 2019.

Design of Media Player

Mohit Jain
dept. of Electronics and Telecommunicaton Engineering
Thakur College of Engineering and Technology
Mumbai, India
99mohitjain@gmail.com

Harshit Srivastav
dept. of Electronics and Telecommunicaton Engineering
Thakur College of Engineering and Technology
Mumbai, India
harshitshrivastav123@gmail.com

Sonu Gupta
dept. of Electronics and Telecommunicaton Engineering
Thakur College of Engineering and Technology
Mumbai, India
sonugupta0281@gmail.com

***Abstract*— The project is about media player where all the medias get played in chronological order. The user-friendly software consists of Buttons which will play, pause, stop and rewind media. The media player is consisting of two parts: music player and video player. The media player was made using Pygame and PyQt5. The music player runs stably and conveniently during testing.**

Keywords*— *Python, PyQt5, Tkinter, Media, Design

I. Introduction

Media player is one of the most used and important software application in today's world. Maximum computer users switch on to the media player as soon as they start the computers and Then Move to their Respective works. Today's era is to do work with high efficiency but at the same time it should consume very less time. And thus, answer to the problems arising in the use of traditional media players. This player gives numerous facilities which differentiate from traditional media players.

Under the current situation of pandemic, Music can influence clinicians' and patients' mental states and emotions via the capacity of rhythm and tone to entrain. Entrainment can facilitate relaxation and distraction from pain and has a role to play in experiences with and in health care. Video Player is useful in this current stressful situation where users can watch videos which will act as a stress-buster and can be useful for their mental health.

II. Literature Survey

[1] Akshaya Anand designed a music player using android programming with the help of API's and framework they designed a bug free music player

[2] Maharshi Pancholi and Akshar Patel designed cross platform media player that works on android, blackberry, windows etc with the help of JAVA and XML.

[3] Shuangyan Jin et al designed a media player where songs are stored in a database in a Linux based operating system and lyrics were displayed synchronously.

[4] Yu Xiang et al designed a media player which stable and convenient to use. They also added more features to make the media player attractive and user friendly.

III. Methodology

The first step of creating the music player is to import the required modules for the media player. Then write a set of codes to create a blank main window to check if the basic application is working or not. Then add the widgets like buttons, sliders, list boxes. Then add button functionality to

buttons so that a particular function could be executed. By adding the button functionality user will be able to play, pause, stop and rewind the media. Then make user interface attractive by adding a background image or by adding a suitable colour. Last step of creating application is the testing and making it user friendly.

The proposed work of the project is given below:

The media player starts with a pop-up menu where user has to choose a directory. Once a directory is chosen songs/video are played in chronological order and various buttons like play, pause, stop, rewind and next/previous etc. gets activated. The user will click on these buttons respective tasks will be done.

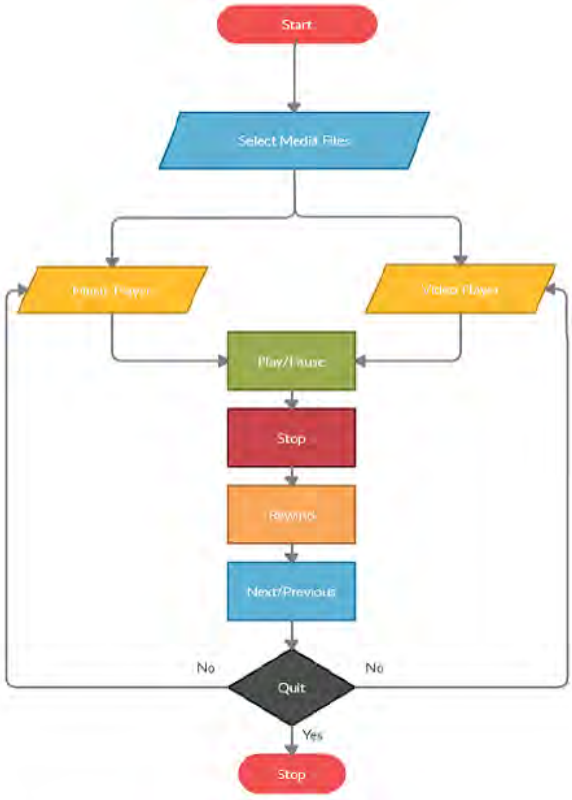


Fig. 1. Flowchart of designing a media player

IV. RESULTS

The user gets the option for choosing the directory for media as seen in Fig.2. Once the user selects the desired media the song or the video will get played. The user will be able to adjust volume, play/pause, stop and go to previous/next song/video in media player. When the user clicks on quit button the music/video gets stopped and the user is exited from application.

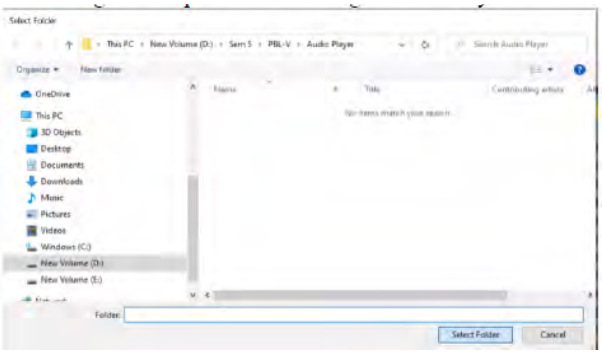


Fig. 2. File directory for music player

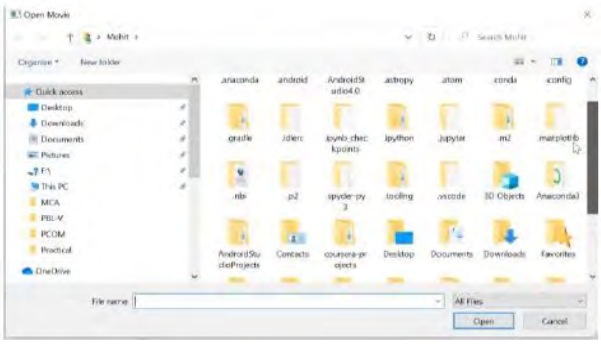


Fig. 3. File directory for video player

Fig. 4. Music player

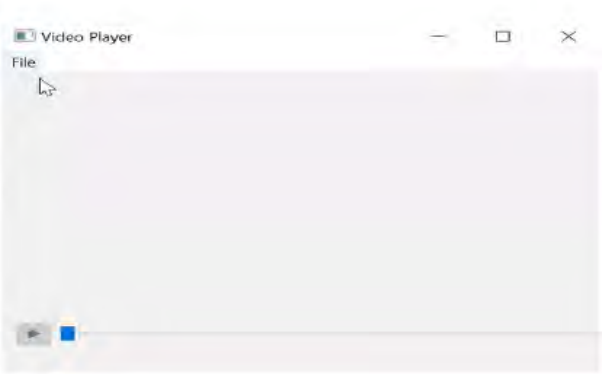


Fig.5.Video Player before the video is chosen

Fig.6.Video Player after the video is chosen

Given below is the link for the demonstration of our project

https://drive.google.com/drive/folders/1xkRXUChyEnyY3HWNs75Ak_NprV2LrNIV?usp=sharing

V. CONCLUSION AND FUTURE SCOPE

The project that was designed was a media player implemented using Python Programming. The software was made user-friendly by Tkinter and PyQt5. Various Buttons were seen in media player and the button functionality was given using functions. We inserted several images to buttons so that user will be able to pause/play, mute/unmute etc and many more things. The media player was designed in two parts : music player and video player. There are many future scopes of our media player. The project has many applications:

- It can be used in any sector
- It helps to reduce stress, pain and symptoms of depression as well as improving cognitive and motor skills.
- It is a safer option to use digital media player because CD's do not remain in a longer condition for a longer time.

Future scope:

1. Implementation of lyrics in music player
2. Making buttons dynamic in media player
3. Adding custom file directory.

REFERENCES

[1] Akshaya Anand, "THE COMPLETE MUSIC PLAYER", volume 6, issue 5, pp- May 2019, IRJET

[2] https://www.slideshare.net/maharshipancholi/androidmedia-player

[3] Shuangyan Jin et al, "Research on media player based on Android", Date of Conference: 29-31 May 2012, Date added to IEEE Xplore: 9 July 2012

[4] Yu Xiang et al, " Design and implementation of music player based on Android", Date of Conference: 19-22 Aug 2011, Date added to IEEE Xplore: 23 September 2011

Traffic Management System for Emergency Vehicles

Prathu D. Garg
Dept. of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
prathugarg95@gmail.com

***Abstract* — There has been significant development in the field of traffic management ever since the boon of image processing and vehicle-to-vehicle (V2V) communication. The major drawback of image processing and V2V communication systems is that these involve hard-core coding and usage of really precise hardware, which in turn makes the system really complex and costly. To reduce this complexity and cost, the proposed system can be used. The proposed system uses laser communication and not traditional RF communication, primarily because it is faster, more accurate and does not pose the problem of RF interference. Essentially the system recognizes the presence of an emergency vehicle on road once the vehicle is in the line-of- sight of the laser receiver and upon detection, the system executes certain predefined protocols which facilitate uninterrupted passage to the emergency vehicle.**

Keywords — Traffic management, traffic optimization, laser communication, emergency vehicles, traffic signal, traffic alert, traffic notification

I. INTRODUCTION

Improving emergency response times is extremely critical, particularly for fire and health-related incidents. However, when the number of vehicles increases at an intersection, this not only increases the response times of emergency vehicles but also increases the likelihood of accidents occurring when emergency vehicles enter intersections at high speed. For example, in Ireland, an average of 700 fatalities are recorded every year because of late ambulance responses. The National Highway Traffic Safety Administration in the US released a report regarding accidents that involved emergency vehicles such as fire trucks, ambulances, and police cars. The agency studied the number of ambulance accidents over the 20-year period of 1992-2011 and estimated that an average of 1,500 accidents involving ambulances occurred each year, wherein 33 people were killed and 2,600 people were estimated to be injured. According to the report, fire engine accidents are the second leading cause of death for fire fighters. There were roughly 31,600 accidents involving fire vehicles over a 10-year period in which 630 fire-fighters were killed. In addition, it is reported that there are approximately 300 fatalities in the US each year during police pursuits, where 30% of the fatalities comprise people not involved in a pursuit. Therefore, reducing emergency response times by minutes or even seconds is crucial in emergency situations. In all the above cases, traffic density and its obstruction to the emergency vehicle at both- the road and traffic signal, has been the prime cause of fatalities.

Unlike western countries, Indian cities do not have separate lanes for emergency purpose due to lack of road planning and infrastructure. As a result, the emergency services vehicles often get stuck at the traffic signals where other vehicles try to squeeze into all the available space so as to move ahead as soon as the signal turns green. The traffic congestion can also be caused by large red-light delays. Once the proposed system recognises the presence of an emergency vehicle, all the vehicles in the vicinity should be notified so that a lane of the road can be left unobstructed for the emergency vehicle to pass by. In case of road intersections where majority of the delay is caused by congestion due to traffic signals, this system optimizes traffic signals for the smooth passage of emergency vehicles.

II. LITERATURE SURVEY

[1] Kapileshwar Nellore, G.P. Hancke, "Traffic Management for Emergency Vehicle Priority Based on Visual Sensing", Nov 2016, DOI:10.3390/s16111892
Methodology: Image and Video processing- an approach to calculate the distance between the emergency vehicle and road intersection using a real-time video feed from the cameras installed at the intersection.
Drawback: Installation cost is high if the cameras used are precise. To reduce the installation cost, using sub-standard cameras will reduce the accuracy of detection, thus increasing the response time of the system. A trade-off between accuracy and any other parameter is undesirable for any system, especially in a system involving emergency vehicles.

[2] Dasari Vishal, Rishika J. Reddy, Bala Abhirami M, "Real Time Traffic Control for Emergency Service Vehicles", Dec 2017, DOI:10.1109/ICCIC.2017.8524354 Methodology: GPS enabled communication- an algorithm is created to govern the traffic signal optimization based on distance of the emergency vehicle from the road intersection taken from the GPS feed of that vehicle. Drawback: The system depends on a Traffic Control Center (TCC) which optimizes the traffic

signals in a particular locality. Therefore, any technical glitch at the TCC will hamper the functioning of all traffic signals in the area. The system uses inter-vehicular communication to alert the nearby vehicles of an emergency vehicle. Hence the system has high complexity and cost involved during both- installation and maintenance.

[3] M.E. Harikumar, M. Reguram, Prathyush Nayar, "Low Cost Traffic Control System for Emergency Vehicles using Zigbee", Oct 2018, DOI:10.1109/CESYS.2018.8724035
Methodology: RF Communication- the system operates on RF communication between two vehicles and between a vehicle and on-road infrastructure.
Drawback: Emergency vehicle data is being transmitted from vehicle to vehicle on the road until it reaches the traffic signal unit. Thus, each vehicle can be considered as a node in the communication system. If there is a glitch at any of the nodes, the entire communication system fails.

[4] Ajmal Khan, Farman Ullah, Zeeshan Kaleem, "EVP- STC at Intersections Using Internet of Things Platform", Nov 2018, DOI:10.1109/ACCESS.2018.2879644
Methodology: Internet-of-Things- the system involves communication of emergency vehicle with the on-road infrastructure using Internetwork.
Drawback: Apart from high complexity and cost of installation, the system is prone to hacking.

III. METHODOLOGY

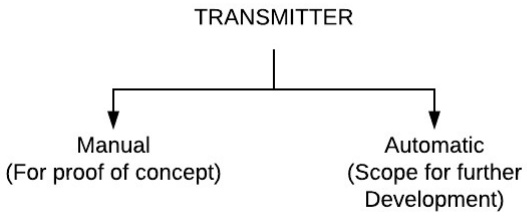
The system uses laser communication technique to identify the presence of an emergency vehicle. There is a laser transmitter attached to an emergency vehicle. The laser receiver is placed at different intervals of the road and at traffic signals. Whenever the transmitter comes in the line of sight of the receiver, detection shall take place. In case of roadside receivers, a display or any such alert mechanism shall be placed to notify other drivers of the upcoming emergency vehicle. In case of traffic signal, along with the alert mechanism as mentioned above, the signal must immediately turn 'green' so that it does not create an obstruction to the smooth passage of the emergency vehicle.

IV. SYSTEM ARCHITECTURE

The proposed system is based on a basic communication model- the data flows from a transmitter to a receiver via a medium. In this system a laser beam, i.e, light acts as a medium for data transfer. The data that is transmitted here is nothing but the confirmation of the presence of an emergency vehicle stuck in traffic. The following events, like triggering of the alert system and turning the traffic signal to 'green', are completely dependent on the above mentioned confirmation.

The architecture of the proposed system is as follows:

1) The Transmitter Block: This block consists of a transmitter circuit. The identified types of a transmitters for this particular system are as follows:



a) Manual Transmitter: This is a readily available laser pointer that is operated by the immediate passenger in the emergency vehicle. The passenger has to point the beam of laser at the receiver to activate the system. This is to be used in the initial development of the system, to provide a proof of concept.
Advantages:

- Easy to implement
- Does not consist of an encoder and amplifier
- Cost effective
- Line of sight for the receiver is easily achieved

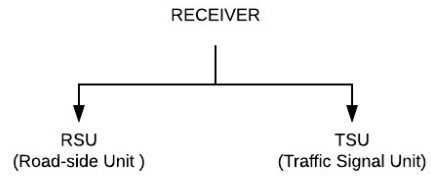
Disadvantages:

- Not a secure mode as anyone can trigger the system by using the readily available laser pointer device.
- The entire system depends on manual operation.

b) Automatic Transmitter: This is a microcontroller based transmitter. This provides a set of on-board I/O's which shall be used to integrate the laser pointer with servo motors so as to detect the receiver and hence establish a line of sight automatically. The microcontoller also adds new avenues like Internet of Things and GPS integragtion. It also provides a way to receive a feedback at the emergency vehicle for the successful activation of the system. This is to be developed later, after successful implementation of the system with a manual transmitter thus providing a scope for further development.

2) The Receiver block: This block consists of the receiver circuit. This is the only block that needs to be implemented during the initial development of the system. This is a microcontroller based circuit. The input to this circuit is provided by a set of photocells, like LDR/ photodiode/ solar panel, as the sensing element. Hence the line of sight should be established between the transmitter and the sensing element at the receiving end. The output of these photocells is fed to the processing unit. Processing of sensor data is important so as to distinguish between the laser beam and other light- sunlight, light from street lamps etc, received at these sensors. The processing will also trigger the desired output, which in this system is optimization of traffic signal and an alert to nearby

vehicles. The identified types of a receiver for this particular system are:



a) Road-side Unit: This is the receiving unit that must be installed along the road at regular intervals. The range of the transmitting laser varies from device to device. Once an appropriate transmitting laser is selected, the intervals of RSU installation can then be easily determined, and vice- versa. The purpose of this unit is to provide alert to nearby vehicles of the upcoming emergency vehicle in the form of a display message and/or alert 'siren' sound. Hence the output of this unit is fed to an LED display and/or speaker, which shall be installed along the road as well. The above mentioned process is depicted in the following process flow diagram:

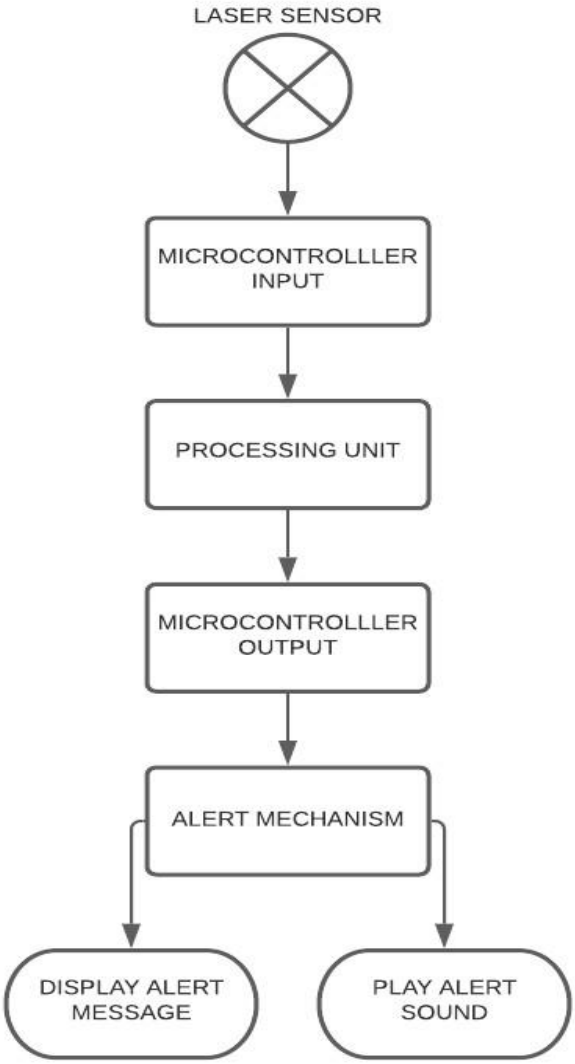


Fig.1: Process flow diagram of RSU

b) Traffic Signal Unit: This is the receiving unit that must be installed at the traffic signal. The primary purpose of this unit is to optimize the traffic signal for the unobstructed passage of emegency vehicles. The above mentioned alert mechanism of the RSU can also be integrated as a secondary output. The optimization of traffic signal is rather easy. No separate algorithm for the same is needed. All that needs to be done is to reset the existing algorithm so that the first 'green' state of the signal appears immediately on the signal that has received the laser transmisssion. If the time for this 'green' state is insufficient for the emergency vehicle to pass the junction, one can always retransmit the laser so as to reset the traffic signal again. The above mentioned process is depicted in the following process flow diagram:

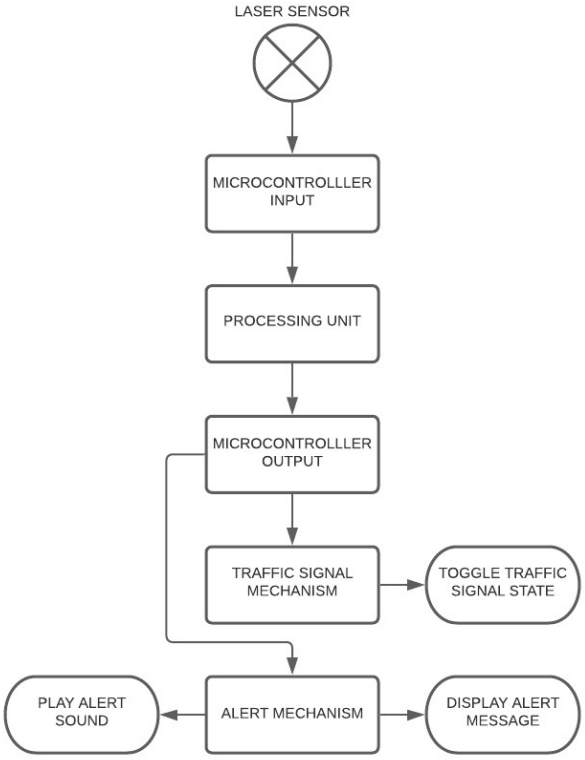


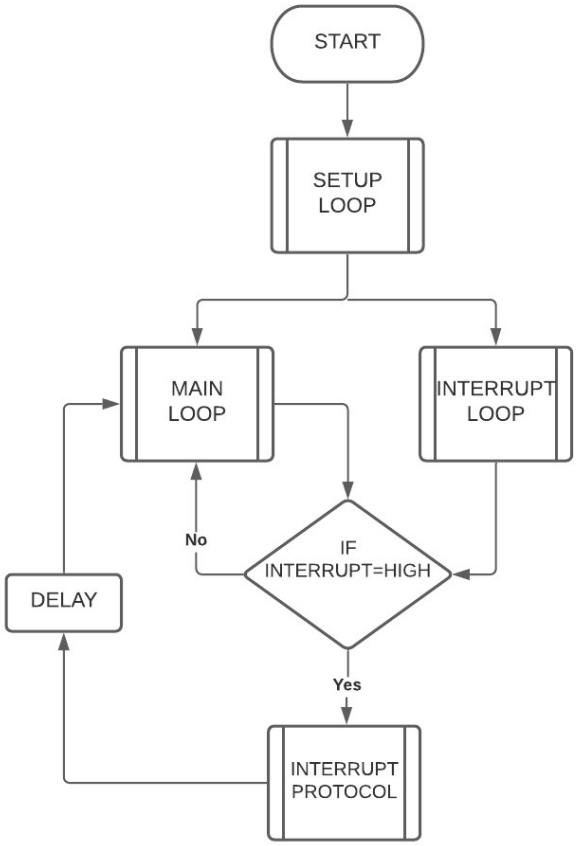
Fig.2: Process flow diagram of TSU

V. ALGORITHM OF TRAFFIC SIGNAL UNIT

Step 1: Start.
Step 2: Initialize I/O's.
a.Analog input- sensing element.
b.Digital output 1- traffic signal.
c.Digital output 2- alert display.
d.Digital output 3- alert sound.
Step 3: Set I/O pins of microcontroller. Step 4: Initialize interrupt sequence.
a.Set a threshold value.
b.Accept signal from analog input.
Step 5: Initialize main sequence.
a.The regular management of traffic signal at a junction.
Step 6: Compare signal value from analog input with the threshold value.

Step 7: If analog input > threshold, jump to step 8, else jump to step 5.
Step 8: Initialize interrupt protocol.
a.Turn traffic signal to 'green' only for the one that received the laser input at the sensing element.
b.Turn traffic signal to 'red' for the remaining ones.
c.Display alert message on the lcd screen.
d.Play alert sound on the speaker.
Step 9: Delay for the emergency vehicle to pass. Step 10: Jump to step 5.

VI. FLOWCHART OF TRAFFIC SIGNAL UNIT



VII. ALGORITHM OF ROADSIDE UNIT

Step 1: Start.
Step 2: Initialize I/O's.
a.Analog input- sensing element.
b.Digital output 1- alert display.
Digital output 2- alert sound. Step 3: Set I/O pins of microcontroller. Step 4: Initialize main sequence.
a.Set a threshold value.
b. Accept signal from analog input
Step 5: Compare signal value from analog input with the threshold value.
Step 6: If analog input > threshold, jump to step 7, else jump to step 5.
Step 7: Initialize alert protocol.
a.Display alert message on the lcd screen.
b.Play alert sound on the speaker.
Step 8: Delay for the emergency vehicle to pass. Step 9: Jump to step 5.

VIII. FLOWCHART OF ROADSIDE UNIT

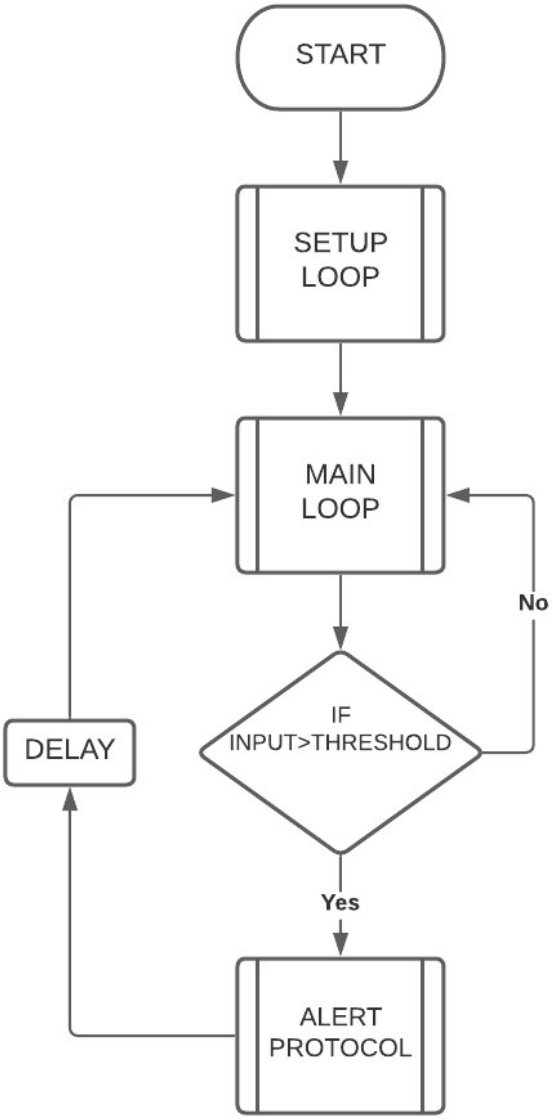


Fig.4: Flowchart of the RSU code

IX. EASE OF USE

1) Categorization: The system can quickly identify the type of vehicle- Emergency or Non-Emergency, as the transmitters are installed only on the emergency vehicles. Implementation of this system is much more convenient as it does not rely on the populace to install the transmitters, as opposed to RF communication, where presence of RFID in almost all vehicles (now a days) makes it difficult to categorize the vehicle with minimum response time.
2) Transmitter: For the proof of concept, a laser pointer can be used as a transmitter. This is because the only data to be transmitted is the presence of an emergency vehicle, which is simply a beam of light from the laser.
3) Receiver: A microcontroller-based receiver can be used. For the sensing element, a photodiode or any such light sensor can be used. This sensor is the only input to the receiver microcontroller. The output of the

microcontroller is different for the Roadside Unit (RSU) and the Traffic Signal Unit (TSU), both of which comprise of readily available hardware and require minimal coding.

4) Communication: For the proof of concept, the immediate passenger in the emergency vehicle shall operate the laser pointer, physically, to establish a line-of-sight whenever the receiver is visible to the passenger. The sensor of the receiver shall be placed behind a convex lens so that with a greater surface area of the lens, the passenger does not have to struggle with aiming at the sensor. Once this line-of-sight is established, communication has taken place and the emergency protocol is immediately activated.

5) Hardware: The proposed system is a communication system, yet the transmitter does not require an encoder and modulator as a light beam is sufficient to transmit the data of 'presence'. Consequently, the receiver does not require a demodulator and a decoder. Also, cheap and readily available components can be used for I/O's of the receiver microcontroller.

6) Software: For traffic signal optimization and alert at the TSU, a mere 'interrupt' is added to the already existing traffic signal code. For alert at the RSU, a basic conditional iteration sequence of 'if' is used.

X. FUTURE SCOPE

1) The proposed system consists of human intervention, i.e, the system is triggered by the immediate passenger in the emergency vehicle. After the successful implementation of the proof of concept an automatic transmitter can be implemented. The automatic transmitter makes the proposed system free from human intervention.

2) One can also integrate GPS technology with the transmitter. Thus, the GPS feed from the transmitter (emergency vehicle) enables users to locate nearby emergency vehicle on their local 'maps' client such as Google Maps. Based on this GPS feed a user can act in the emergency situations and take appropriate measures to mitigate the issue until the emergency vehicle arrives.

3) The proposed system needs significant development in terms of security. If a readily available laser pointer is used then anyone with such a laser device can trigger the system.

4) The output of the alert mechanism of the proposed system can be used for commercial purpose as well. The screens used here can be considered as a source of viable advertisement when the alert mechanism of the system is not triggered.

XI. CONCLUSION

The proposed system overcomes the drawbacks of earlier systems, mentioned in Section II of this document, by:

1) A trade-off between cost and accuracy is eliminated as the cost of the proposed system is much lower. This is because high accuracy components are available at much lower prices as compared to the previous systems.

2) The complexity is extremely low as compared to previous systems as the proposed system involves communication only between the emergency vehicle and the on-road infrastructure.

3) During the initial development, the threat posed by internet security is irrelevant. If only IoT application is integrated, the threat of internet security is introduced.

REFERENCES

[1] Kapileshwar Nellore, G.P. Hancke, "Traffic Management for Emergency Vehicle Priority Based on Visual Sensing", Nov 2016, DOI:10.3390/s16111892

[2] Dasari Vishal, Rishika J. Reddy, Bala Abhirami M, "Real Time Traffic Control for Emergency Service Vehicles", Dec 2017, DOI:10.1109/ICCIC.2017.8524354

[3] M.E. Harikumar, M. Reguram, Prathyush Nayar, "Low Cost Traffic Control System for Emergency Vehicles using Zigbee", Oct 2018, DOI:10.1109/CESYS.2018.8724035

[4] Ajmal Khan, Farman Ullah, Zeeshan Kaleem, "EVP- STC at Intersections Using Internet of Things Platform", Nov 2018, DOI:10.1109/ACCESS.2018.2879644

This page is kept blank intentionally

Aerial Surveillance Drone

Pratik Bhuwania
E&TC
Thakur College of Engineering and Technology
Mumbai, India
PratikBhuwania145@gmail.com

Mohit Butola
E&TC
Thakur College of Engineering and Technology
Mumbai, India
mohitbutola18@gmail.com

Vatsal Doshi
E&TC
Thakur College of Engineering and Technology
Mumbai, India
vatsaldoshi@gmail.com

Niket Amoda
E&TC
Thakur College of Engineering and Technology
Mumbai, India
niket.tcet@gmail.com

***Abstract*— This paper presents an approach for a Aerial Surveillance Drone using PID controller and sonar sensor for obstacle and collision avoidance. In this work, a quadcopter is designed and constructed from the scratch. A closed loop control feedback mechanism used in PID controller is implemented to maintain stability and steadiness. An ultrasonic sensor device is used in the sensor module to overcome the obstacle and collision avoidance issue.**

Keywords: Self Navigation, Command Centre GUI, Return to Origin, Sonar based Altitude hold, obstacle detection, failsafe via remote controller.

I. INTRODUCTION

Quadcopter also usually known as drone or Unmanned Aerial Vehicle (UAV) is either an autonomous or remote controlled state-of-the-art aerial flying vehicle without a human on board. Quadcopters have the VTOL (Vertical Take Off landing) characteristic unlike the other conventional flying objects or the Unmanned Aerial Vehicles which allows to hover at a particular point. They are highly suitable for environments (i.e. indoor or congested environment) where human access is at difficult situation. Due to their portability in size, there is an ease of usability in accomplishing tasks or missions such as commercial applications like package delivery from one building to another, search and rescue work, research and developmental works in agricultural, geographical, surveying and military areas, etc. It consists of four rotors which makes the vehicle mechanically simpler than an ordinary helicopter as it does not need to have variable pitch for the rotors (propellers) and it is the most popular multi-rotor rotorcraft. During the recent years, small scale quadcopters are increasingly gaining attention due to the fact that they are highly agile, capable and manoeuvrable apart from being cheap and can be constructed using easily available parts. Hobbyists and researchers use them as an advanced and a versatile platform to implement and test new ideas in a number of different fields. They have reached exceptional levels of growth in several fields say military and civilian applications. The conventional flying vehicles are sometimes prone to failure either due to lack of delivering the desired service or constant requirement of maintenance. Due to limited controls and system integrations in the early designs of 1920s and 1930s the results were of poor performance and lack of stability. But with the recent advance and development in electronics, accurate sensors and control system technology these limitations are now receding.

The paper is divided into several sections. Section II presents the related works done regarding quadcopters, section III describes about a quadcopter, section IV gives the concept of flight dynamics and its control system. Section V presents the experiment and results obtained. Section VI consist of Survey and finally the conclusion and future work is given in Section VII.

II. RELATED WORKS

The quadcopter concept started as early as the 20th century and the earliest work were started by George DeBothezat and Etienne Oemichen [1]. Their work failed due to lack of proper lifting power, instability, unresponsive and susceptibility to reliability issues. After putting efforts in recalculations and redesigning, the mentioned issues were overcome. Until the mid-1950s the quad copter designs done by Marc Adam [2] got into its true shape and structure which was also the first quadcopter designed to have flown forward successfully. Several types of quadcopters are being built by many research individuals, groups or hobbyists according to the desired purposes. Some of the successful work found are Arducopter, Pixhawk, KK Multicopter, MultiWii, Parrot ARDrone, Microkopter, DJI Wookong and other various Open Source Projects [3]. It is obvious a UAV is sure to face obstacles either in indoor or outdoor environment or both and thus the avoidance of obstacles namely collision avoidance becomes a crucial task to overcome as cited by the United States Department of Defence [4]. Meister et.al[5] and Moses et.al [6] investigated collision detection and avoidance using multiple sensors. Sensors like RADAR, LIDAR, ultrasonic sensors, laser range finders, infrared sensor, etc. are used for ranging and detection of obstacles and hindrances in the flight trajectory for the UAV system [7]. Small size UAVs are subject to normal rotorcraft aerodynamics i.e. causing loss of lift due to wind turbulence either generated by itself or by external environment factors. There is a need to overcome such situations by continuously observing and balancing via the closed loop control feedback system. This can be achieved by Proportional Integral Derivative (PID) controller which calculates an error value determining the difference between the set point and the desired

output [8]. An efficient quadcopter can be achieved by using an efficient stabilizing control system like PD controller, PID controller, back stepping, Kalman Filter and so on [9], out of which PID is most commonly and widely used [10 &11]. Some of the quadcopters are capable of altitude hold feature, in which it maintains a consistent altitude while allowing roll, pitch, and yaw to be controlled normally via the remote controller by a human [12].

III. QUADCOPTER DESCRIPTION

Copters are versatile and due to manoeuvrability to execute various tasks, they possess certain complexity. In conventional copters, a main rotor and a tail are equipped together. In this project a quadcopter is used which is constructed by four equal length aluminium rod serving as the frame with four symmetrical propellers at the end of each frame rod. The stable hovering and accurate flight can be achieved by balancing the forces generated by the four propellers. Two of the motors (say M1 and M3) in the quadcopter will rotate in counter-clockwise direction and the remaining two motors (M2 and M4) in clockwise and due to rotational axis a net torque of zero will be resulted as illustrated in Figure 1.

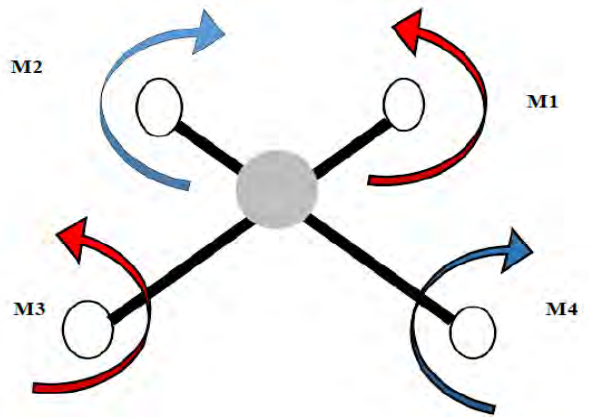


Fig. 1. Quadcopter motor configuration

To achieve the desired autonomy, first and foremost a stable flight needs to be attained. The symmetrical design of the quadcopter also allows an easy control in stabilizing the flight. To manipulate the thrust exerted by the motors, controllers are required which can be done by using a microcontroller. An electronic device called Inertial Measurement unit (IMU) is used which includes combination of the sensors– accelerometer, gyroscope and an ultrasonic sensor. An IMU is used to determine the angular rotation as well as the linear acceleration of data that are given as input to a microprocessor.

Each of these sensor devices can determine 3 axes of coordinates (x, y and z). For instance, combination of accelerometer and gyroscope will give number of different independent parameters that describe the state or configuration of the system which is called 6 Degrees of Freedom (6 DoF). A gyroscope is commonly used in quadcopter control boards as it gives the angular rate around the 3 axes of space and to get the orientation of pitch and roll, a 3-axis accelerometer can be used.

The key parameters of a flight system are the angles of rotation in three dimensions about the vehicle's centre of mass, known as roll, pitch and yaw as illustrated in figure 2.

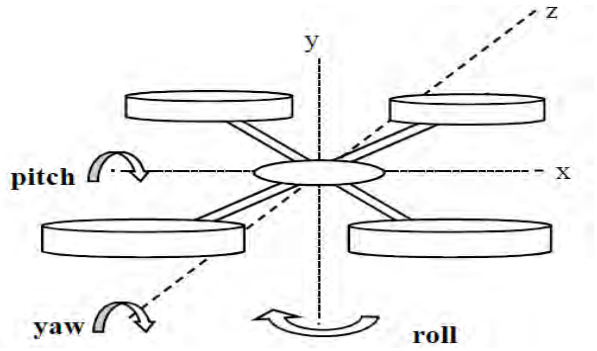


Fig. 2. Flight Dynamics

Inertial Measurement Unit (IMU) is used to determine the pitch, yaw and roll by calculating the values for the parameters of stability controller, i.e. PID controller. It measures the error value as a difference between a measured input and a desired target output which may be used in take-off, flying forward or even avoiding an obstacle. The data from the sensors – accelerometer and gyroscope is given as input to the PID controller to determine the stability, acceleration and orientation as well as it will sense any changes during the flight.

IV. FLIGHT SYSTEM AND FLIGHT CONTROL SYSTEM

Specially designed propellers of various dimensions and materials to generate required thrust can be used based on the quadcopter configuration. Each propeller is attached to the motors. The motors are chosen depending on the weight of the quadcopter, also known as all up weight (AUW). The thrust that each motor will exert can be determined by the following rule.

General rule of thumb is

Required Thrust per motor = (AUW x 2) / 4 (1)

Power is supplied by a high capacity lightweight battery. Li-Po batteries are best suited for this purpose. They can deliver high amount of current at short time which is required by the motors for the lift and have very small footprint.

A microcontroller with at least 4 digital IO/PWM (pulse-width modulation) to signal the motors via the electronic speed controllers (ESCs). The microcontroller should also have an interface like Inter-Integrated Circuit (I2C) to connect to the IMU device so that the number of ports necessary to attach multiple sensor devices are reduced. As stated previously, accelerometer is required to sense the orientation, position and velocity without the need for external reference. With an accelerometer alone, either a really "noisy" data output that is responsive, or a "clean" output that is sluggish is obtained. But when the 3-axis accelerometer is combined with a 3-axis gyroscope, an output that is both clean and responsive at the same time can be acquired. Gyroscope utilizes angular momentum to determine orientation and change of direction. In order

to understand the arrangement of the hardware components, the schematic wiring block diagram is represented as follows:

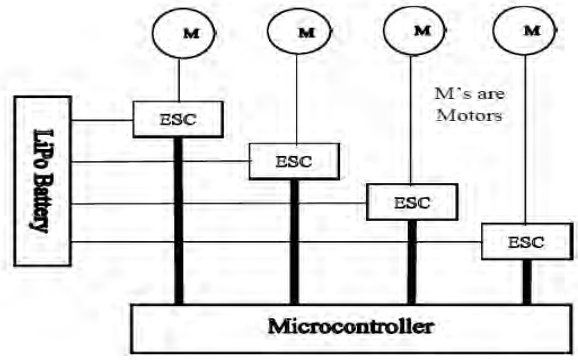


Fig. 3. Schematic Wiring Block Diagram

V. EXPECTED RESULTS

A. Motor

Initial experiments is to determine hardware selection. The right selection of hardware are the key to a proper construction of a quadcopter. The first experiment will be done on the motors to find out the features like weight and thrust it can generate with different types of propellers varied by its length.

Using weighing scale to measure thrust of each motor with the different types of propellers (10, 8 inch and variable pitch for each) attached. The test measures thrust at low, med and high capacity of the motor including the duration of draining the battery from full charge to min charge. Note that four motors have to be connected during actual flight, so the battery drain duration will actually 4 times less than this test.

For this project, Arduino Nano 328 also known as Arduino ATMega 328 microcontroller is used. Unlike the other available Arduino based microcontroller (only relevant ones) for instance Arduino UNO and Arduino Pro, Arduino Nano 328 has its own USB plug in whereas in Arduino UNO an extra board is needed for USB plug in which adds extra weight above its own bulky size and heavy weight. Arduino Nano has the USB to serial chip and connector on- board with 8 analog pins and 14 digital pins. The ultrasonic sensor used in the quadcopter can measure accurately from 2 centimetres to 5 meters which was tested with different surfaces like cemented ground, grass, water, plastic, wood,

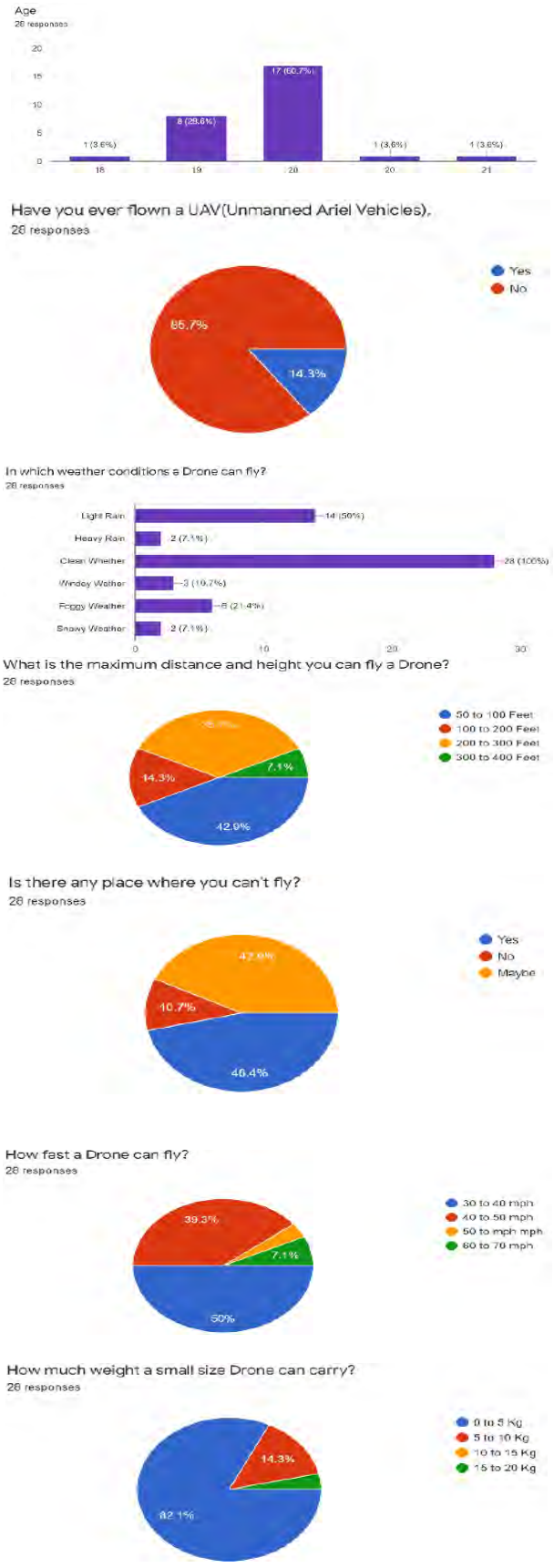
metal etc. Water did not yield correct distance between the source and the surface so care needs to be taken so that quadcopter does not fly over water bodies and result in intended consequences.

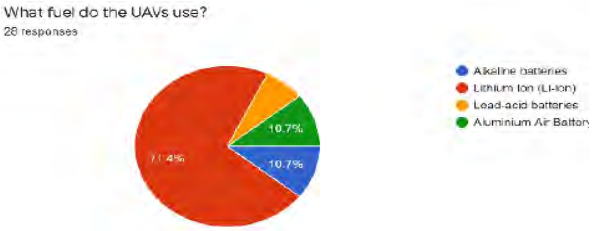
B. Quadcopter assemble and flight

The quadcopter will be constructed using four motors, propellers, microcontroller and sensors on board.

The work of quadcopter carries certain risk and so needs a lot of care while working on it. The Li-Po battery used needs frequent checking while charging as well using as an overload may lead to an explosion of the battery and could be the reason for fire. To avoid danger and damage to anyone and to the quadcopter the flight test was done in an open space.

VI. SURVEY





VII. CONCLUSION

The objective of this work is to give an autonomous quadcopter with a stabilised and efficient performance using PID controller. The three parameters P, I and D are the key for stabilization of the quadcopter. Sonar technique is used for implementing an enhanced system of obstacle and collision avoidance. The work of quadcopter carries certain risk and so needs a lot of care while working on it and so certain limitations had to be faced while carrying out the work like air turbulence during take-off and landing, inconsistencies in quadcopter material, rigidity of the quadcopter structure and unsteady wobbly nature of rigid propellers. Sustainable materials of hardware were used so that more work and application can be expanded in future like addition of vision to the quadcopter for localization and navigation. With the vision support surveillance applications in the field of traffic, agriculture, animal observation and various research study can be extended. Further works on it with neural network techniques can help in achieving an artificially intelligent quadcopter. Working on the failsafe to be an inbuilt will help in detecting crashes automatically as well as implementation of a reliable Dead Reckoning technique. The usage and application of a quadcopter are dynamic and so it can be extended and expanded to many varying degrees of changes and development.

REFERENCES

[1] Mark Dupuis, Jonathan Gibbons, Maximillian Hobson-Dupont, Alex Knight, Artem Lepilov, Michael Monfreda, George Mungai, Design Optimization of a Quad-Rotor Capable of Autonomous Flight, WORCESTER POLYTECHNIC INSTITUTE, April 24, 2008

[2] Peter O. Basta, Quad Copter Flight, California State University, Northridge, May 2012

[3] Hyon Lim, Jaemann Park, Daewon Lee, H.J Kim, Build Your Own Quadcopter, Digital Object Identifier 10.1109/MRA.2012.2205629, Date of publication: 10 September 2012, IEEE ROBOTICS & AUTOMATION MAGAZINE , http://robotics.snu.ac.kr/upfiles/papers/Build%20Your%20Own%20Quadrotor.pdf

[4] United states department of defense, 2014. [Online]. http://www.defense.gov/news/newsarticle.aspx?id=122308

[5] O. Meister, N. Frietsch, C. Ascher, and G. Trommer, "Adaptive path planning for a vtol-uav," in Position, Location and Navigation Symposium, 2008 IEEE/ION, may 2008, pp. 1252 –1259.

[6] A. Moses, M. Rutherford, and K. Valavanis, "Radar-based detection and identification for miniature air vehicles," in Control Applications (CCA), 2011 IEEE International Conference on, sept.2011, pp.9

Health Management and Diseases Control

Vishal Jana
dept. of Electronics and Telecommunicaton Engineering
Thakur College of Engineering and Technology
Mumbai, India
vishaljana031@gmail.com

Om Prakash Jangid
dept. of Electronics and Telecommunicaton Engineering
Thakur College of Engineering and Technology
Mumbai, India
opjangid17@gmail.com

Aakash Jha
dept. of Electronics and Telecommunicaton Engineering
Thakur College of Engineering and Technology
Mumbai, India
aakashjha2050@gmail.com

***Abstract*—Implementation health management system project helps to store patients' contacts records, provide coordination with hospital and user communication, improve day-to-day information update, arrange the patient appointment and manage donation system. User can gain information about symptoms, Precautions, prevention, causes, diet about certain number of different diseases all in one place. This makes it more efficient and useful for people. Also, where people can contact to doctors and experts and they can solve their queries related to diseases. Also, it is helpful for the people with disability like color blind, not able to read or any kind of language understanding problem. In this way this websites aware the people and manage the diseases.**

Keywords— Database, JSP, JavaScript, Appointment, select color, select language, Diseases management, spread awareness

I. INTRODUCTION

Java is the most widely used technology to design web applications since last decade. It's based on MVC architecture that uses Spring Hibernate ORM framework. While there is no denying that Java is efficient and powerful tool but it cannot meet the ever changing needs and requirements of modern technology. JavaScript has emerged as powerful tool that enables developers to build highly responsive web applications while simultaneously giving them access to powerful libraries to customize their application. The social problem that majority of the people face is the need of right information at a easy and most efficient way possible. A health and diseases website can overcome these problems and deal the dangerous disease effectively.

II. PROBLEM DEFINITION

Following are the problem definition that this website has refer :

Consumer experience – User are unable to understand the content of website.

Travel advice–Patient didn't know how to travel and what precaution should take when they are suffering from diseases.

Complexity – There are different sites for different diseases and difficult to operate the website for user.

Hospital unavailability– User are unable to book an appointment due to lack of information(resources).

Language barrier– Not all people can understand English due to which they are not able to understand the content on website.

III. MOTIVATION

Creating a diagnosis and appropriate treatment plan is only half the battle for doctors; actually getting patients to follow through is its own beast. Providers can better achieve overall patient wellness by using a set of patient motivation techniques that drive better health behavior.

In all of healthcare, but especially in chronic disease management, it is important for patients to be active participants in their own wellness journey. Patients are the sole drivers of health behavior change, care management activities, and medication adherence. And while some patients may be intrinsically motivated to improve their health, others may require provider encouragement.

For such a important issue our motivation was to design and develop a website for people suffering from these circumstances and help the needful people when they are mostly needed. Due to the pandemic of Covid 19 patients are not able to gain knowledge for their problem due to lockdown.

IV. LITERATURE SURVEY

CDC-It contain various disease (symptoms, awareness, campaigns, guidance), travel management (travel recommendation in current pandemic and booking), environment health plans (natural disasters) and it provide cdc's official application(for android and ios).

NFID(National foundation for infectious disease)-This website is contain all about disease (Symptoms, diagnosis, prevention, treatment).

CDC and NFID both don't gives you option for taking appointment in hospital. Also there are lots of information in disorder manner. User not able to understand the content properly

NMDC- OUR WEBSITE (National Management of Disease Control)-We mainly focus on various deadly disease (awareness, Suggestions, Advices, Symptoms, prevention etc.) and Hospitals appointment, donation to NGOs. We also provide option if any case of query they can ask us.

V. PROPOSED DESIGN

In this website there are many features which help to spread the awareness for deadly diseases. This website also responsive and user friendly. This website is compatible to any device so any user can use this website on any device.

Design that our website has developed for people easy access and understanding are:

1. Our proposed design was to design and develop a

website that can help needy people at any time

2. To overcome the disease management issue in our nation our website is a solution.

3. This website showcase different disease information, appointment booking, donation, different disease equipment, travel advice and many more… .

4. Website provide different diseases overview, symptoms, cause, prevention, risk factors, treatment, what to eat, etc

5. Contact information and address for different hospital all over country to book an appointment.

6. User can donate to different cause NGOs to help poor and underprivileged people.

7. Website provide different disease equipment shopping link in our website

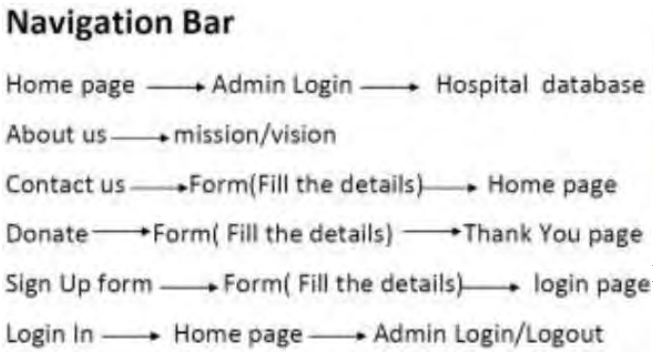


Fig. 1. Data flow diagram(1)

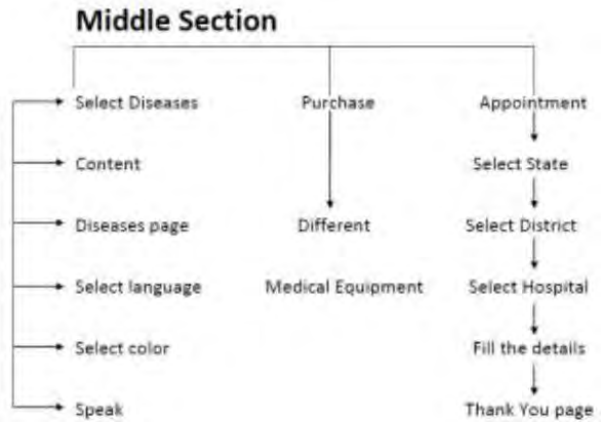


Fig. 2. Data flow diagram(2)

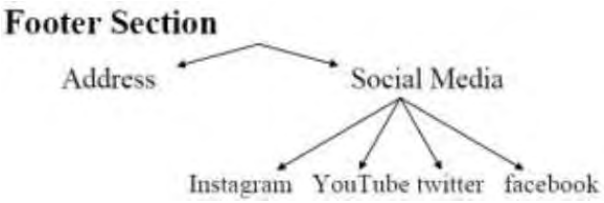


Fig. 3. Data flow diagram(3)

VI. RESULT & DISCUSSIONS

The NMDC website was successfully completed using
database and supporting element. It consists of a navigation
bar that has three basic options – Home , About, Contact Us, Donate, Login, and Sign up. The navigation bar is visible on every pages. Hence it provides the facility to user to access them.

Fig. 4. Home Page

The Home Page shown in figure A, is the default page of the website. It will also provide direct login and signup option.

The next webpage is Signup page. It's the first page with which user interaction begins. Every new user will be required to provide data such as email, password and mobile no. The Signup process is deemed successful only when email is correct and input of password and confirm password matches with each other. While these things can't be demonstrated just at this stage but keeping database design in mind.

Fig. 5. Signup Page

Website Accept donation for NGOs to help people with medical treatment and medicine as seen from Fig. 6.

The next web page that we have created is Login page as seen from Fig.7. It will act as an intermediate between authentication and user data layer. The access to profile is granted only if user enters the correct credentials.

Navigation bar of disease's webpage include three options-select language, select color, speak.

Speak- Website (Fig.8.) has developed an audio version of the website that read the content of that webpage it's option for those who are partially impaired.

Fig. 6. Donate

Fig. 7. Login Page

Fig. 8. Speak

Select language (Fig.9.)-Translator of website into various languages for better understanding.

Select color (Fig.10.) -Change the color of the text of whole website content so the color blind person can choose the color of text of website as per his/her convenient.

Website gave option for shopping necessary medical equipment for all diseases are available in one website as seen in Fig. 11.

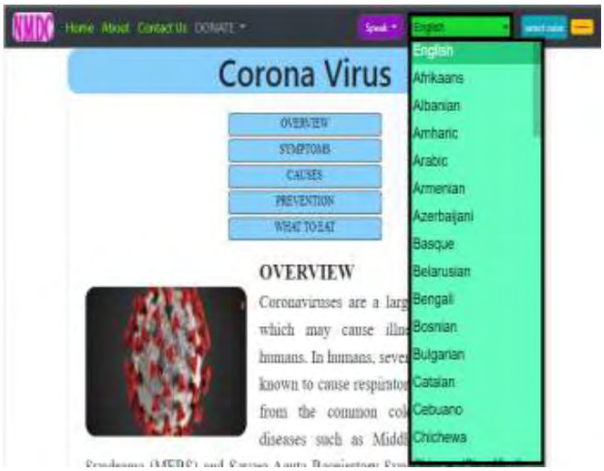


Fig. 9. Select Language

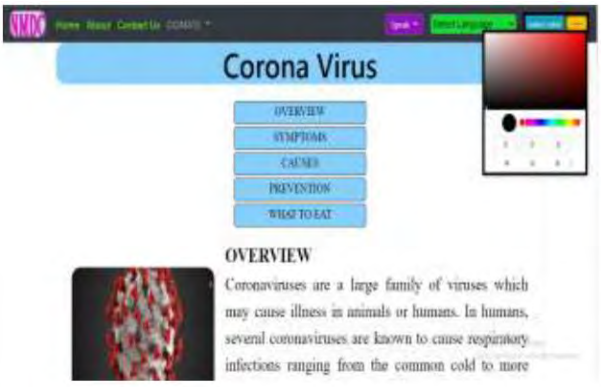


Fig. 10. Select Colour

Fig. 11. Purchase

VII. Scope of Project

With the help of hard work and the results that we have achieved these is the conclusion that our website provide.

People who is suffering from corona symptoms daily life will have great influence of our website People who is suffering from other major disease like cancer, diabetes, tuberculosis, etc can understand more about their conditions.

This project is boon for those people who live alone. They do not have proper information about diseases also they not able to travel to hospital but now we have solved their problem.

Website have help NGOs by accepting donation from our user for people who are genuinely in need. Website has cooperated with hospital organization regarding the appointment for patients.

VIII. CONCLUSION

With the help of hard work and the results that we have achieved these is the conclusion that our website provide. People who is suffering from corona symptoms daily life will have great influence of our website People who is suffering from other major disease like cancer, diabetes, tuberculosis, etc can understand more about their conditions This project is boon for those people who live alone. They do not have proper information about diseases also they not able to travel to hospital but now we have solved their problem. Website have help NGOs by accepting donation from our user for people who are genuinely in need. Website has cooperated with hospital organization regarding the appointment for patients.

REFERENCES

[1] CDC- Government website https://www.cdc.gov/globalhealth/countries/india/default.htm

[2] NFID(National foundation for infectious disease) https://www.nfid.org/

[3] NCDC (National Centre for Disease Control) https://ncdc.gov.in/message.php?id=no

[4] NUFIT https://www.nufithealth.com/Disease_Management.aspx#:~:text=Th%20number%20of%20people%20living,financial%20burden%20on%20the%20family

[5] DMAI https://dmai.org.in/

[6] Research paper https://www.rand.org/pubs/technical_reports/TR562z15/analysis-of-disease-management.html

Web Development on Reuse of Electrical Equipment

Ritvik Moorthy
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
ritvikmoorthy@gmail.com

Nivesh Pawar
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
niveshpawar786@gmail.com

Manas Patil
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
patilmanas416@gmail.com

***Abstract* — Electrical World is a website which refers to creating a user friendly interactive and responsive webpage. The website is based on simple HTML codes and the different types of CSS. The website contains information on the Electrical equipment that can be reused in small projects or by different methods.**

Keywords — HTML, CSS Code, Web application, UI.

I. INTRODUCTION

The project is based on the domain of highlighting the importance of electrical components in day to day life of everyone and especially for students in learning about electrical components and can be reused in various machines and devices. The process involves creation of a website which provides information about electrical components and spreading awareness about how they can be reused in various ways. In this way the electrical components waste produced can be reused and can be used for educational purposes like mini projects, etc. and save environment in a very convenient way.

II. PROBLEM DEFINITION

The consumption of electrical equipment is continuously increasing worldwide and, consequently, so is the amount of waste of electrical equipment out of which most can be reused by doing slight repairs. Government schools and colleges which are low on funds can be helped by using reusing electrical equipment which are damaged either by repairing them or can be used as displays for explaining students in labs.

III. MOTIVATION

After doing the literature survey, a thought came to our mind which gave us the motivation for the innovation of such ideas and project where we could provide a platform where people could gain ideas and knowledge about electrical components which could be put to good use and incline people towards reusing them by applying the knowledge they gained from our website as well as it could be used as an educational website by students as it would help them in making many mini projects using these electrical components.

IV. LITERATURE SURVEY

The management of Waste Electrical Equipment has much scope for improvement in almost all countries. Some legislation, such as the

European Directive, aims to increase reuse, to prevent such equipment from being recycled without being reused. In this sense, the reuse of electrical equipment has a huge interest from an economic, environmental, legal, and social viewpoint. However, this has not been studied much so far.

V. PROPOSED DESIGN

The project was made keeping in mind the needs of people for access and towards e-learning. Thus a website named Electrical World has been created by us for providing a solution to the problems faced by various people. The website has 4 tabs:

- HOME.
- INFORMATION.
- REUSE.
- ABOUT.
- CONTACT US.

Figure 1. Data flow diagram

VI. RESULT & DISCUSSIONS

The goal was to implement the above vision as a part of our bigger plan to create a safe and green environment by improvising and helping the educational sector as well so to also improve the next generation by engraving the Importance of reuse in their minds who would empower our nation.

Figure.2

HOME- General information will be displayed regarding small projects that can be made by reusing electrical equipment.

Figure.3

INFORMATION- Specific information the user wants is displayed relating to the electrical equipment the user wants to know about.

REUSE- This page provides you the information about the various things/devices which contain Electrical equipment and how they can be used for our betterment in different ways.

Figure.4

ABOUT - Will be about why our team decided to make this website and spread awareness about electrical waste generated.

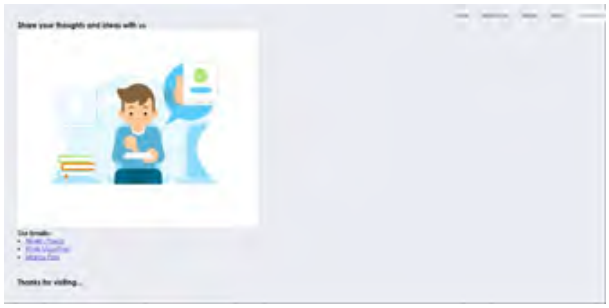


Figure 5

CONTACT US- Will contain our contact details if the user wants to reach out to us for any queries or just give a general feedback to make our website better and more informative.

VII. SCOPE OF PROJECT

This project is based on the idea of an informative website which will educate people on how to reuse electrical components to reduce wastage but in the future a website can be created which will link people who are willing to donate their damaged and old electrical equipment to schools and colleges who are in need of with the help of a refurbishing team at free of cost or subsidized rates depending on the condition of the electrical equipment donated.

VIII. CONCLUSION

This project was created using HTML and during research it helped us understand and gain knowledge about why electrical waste management has become so important for us. With the help of this website the user will get to know about:-

- Easy to access
- Electrical Equipment used in various gadgets
- Small Projects.
- Place where people can share their ideas.

REFERENCES

• www.sciencedirect.com
• Ieeexplore.ieee.org
• scholor.google.co.in
• Google images
• www.freepik.com
• www.electricalhub.com
• Journal of waste recycling: Dr. Shalini Sharma
• Environmental and toxicology studies journal: S Suresh Kumar
• Journal of waste recycling: Samroot Samreen Wani.

Electronic Waste Management

Dhruv Pandey
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
dhruvpandey2209@gmail.com

Anuj Pandey
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
anujpan0709@gmail.com

***Abstract* — Electronic waste or E-waste is relatively a novel addition to the ever-growing hazardous waste stream. It includes discarded electronic and electrical equipment. Developing countries are facing enormous challenges related to the generation and management of E-waste which are either internally generated or imported illegally; India is no exception to it. However, the existing management practices related to E-waste in India are reasonably poor and have the potential to risk both human health and the environment. Moreover, the policy level initiatives are not being implemented in an appropriate way. The austere problem of E-waste along with its policy level implications is looked upon in the paper. During the course of the study it has been found that there is an urgent need to address the issues related to E-waste in India in order to avoid its detrimental future consequences. E-waste" is a popular, informal name for electronic products nearing the end of their "useful life. "E-wastes are considered dangerous, as certain components of some electronic products contain materials that are hazardous, depending on their condition and density. The hazardous content of these materials pose a threat to human health and environment. Discarded computers, televisions. VCRs. stereos, copiers, fax machines, electric lamps, cell phones, audio equipment and batteries if improperly disposed can leach lead and other substances into soil and groundwater. Many of these products can be reused, refurbished, or recycled in an environmentally sound manner so that they are less harmful to the ecosystem. This paper highlights the hazards of e-wastes, the need for its appropriate management and options that can be implemented**

I. INTRODUCTION

E-waste or electronic waste is created when an electronic product is discarded after the end of its useful life. The rapid expansion of technology and the consumption driven society results in the creation of a very large amount of e-waste in every minute.The European WEEE Directive classifies waste in ten categories: Large household appliances (including cooling and freezing appliances), Small household appliances, IT equipment (including monitors), Consumer electronics (including TVs), Lamps and Luminaires, Toys, Tools, Medical devices, Monitoring and control instruments and.

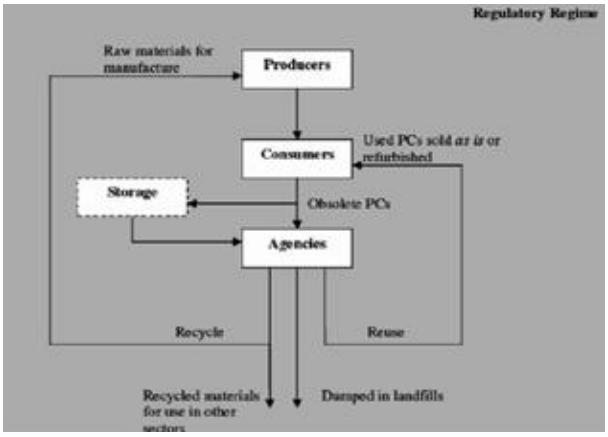
II. PROBLEM DEFINITION

The key to efficient waste management is to ensure proper segregation of waste at source and to ensure that the waste goes through different streams of recycling and resource recovery. Then reduced final residue is then deposited scientifically in sanitary landfills. Sanitary landfills are the ultimate means of disposal for unutilized municipal solid waste from waste processing facilities and other types of inorganic waste that cannot be reused or recycled. Major limitation of this method is the costly transportation of MSW to far away landfill sites.

A report by IIT Kanpur (2006) found the potential of recovering at least 15 per cent or 15,000 MT of waste generated every day in the country. This, the report said, could also provide employment opportunities to about 500,000 rag-pickers. The report added that despite immense potential in big cities in this area, participation from non-profits or communities is limited. Recovery of e-waste is abysmally low, we need to encourage recycling of e- waste on a very large scale level so that the problem of e-waste disposal is contained.

III. MOTIVATION

We all know that waste management is important to maintain our ecosystem and our environment .Although the Indian Government introduced its first dedicated e-waste management policy in 2011 and expanded its scope in 2016, less than 5% of e-waste in India is recycled through formally regulated units. The informal sector handles the rest, with very little control for environmental and worker health and safety. Several million informal sector workers are involved in recovering valuable metals from e-waste, largely through hazardous and unsafe practices such as open-air incineration and acid.



IV. RESULT & DISCUSSIONS

Most of the electronic gadgets are large and small household appliances. From our own experience, it became difficult to find a person to repair the household articles and the cost for the repair is really a big

problem for the common people. Showrooms and shops selling household appliances can attach a repairing center with them to repair the article. They can also think about home service.

Causes :-

- The rapid growth of users of computers and other technology devices.
- Disposal of technology devices is not an easy task, as they contain hazardous materials.
- Average lifespan of electronic devices is decreasing as people are updating their houses with new electronic devices.
- Transferring e-waste from developed countries to developing countries in the name of donations.

Effects:-

- Resources are wasted as valuable materials in e-waste are being dumped in normal wastage.
- Toxic materials in e-waste cause severe health risk.
- Environmental damage.
- Land filling of e-wastes can lead to the launching of lead into the groundwater.
- When CRT (cathode ray tube) is burned, it emits toxic fumes into the air.
- The cadmium from one mobile battery can pollute 600 m3 of water.
- Informal recyclers are attracting the poor people in the name of employment and making them disassemble the components with bare hands and without any precautions, which is highly dangerous for their health.

Solutions:-

- Manufacturer must take the responsibility for the product after the completion of it's lifetime to disassemble and reuse or recycle the components.
- Customers must buy products from the manufacturers who take back their product or who offer discounts on new products by taking old products.
- Manufacturers must try to design the eco- friendly products as lead-free, halogen-free and recycled plastics.
- Lifetime of products must be increased.
- Government must take action on informal recyclers.
- Collection centers of expired electronic and electrical goods must be there. So that e- waste will not be mixed and burned along with normal wastage.
- Public awareness programs must be conducted because the role of consumers is very high in this issue.
- Government must collect the total data of e-waste including legal and illegal imports from developing countries. So-that the private sector will come forward.

V. SCOPE OF PROJECT

The scope of Waste Management in India has now reached the highest level for the individuals. One can make his/her career in India after completing several degrees, diploma courses, and certifications. There are a number of job opportunities. If you want to become a mere refuse or waste collector, who readily collects waste and put it into waste disposal sites or recycling plants, you don't need any professional degree.

However, if you want to become a Waste Management Officer (WMO) or someone who is responsible for making all the big decisions, you will surely require a professional degree in a relevant subject. The primary roles and responsibilities of professionals in India are managing or handling the entire nation's waste on a daily.

VI. CONCLUSION

The front end of the dynamic web application has been successfully completed under Project Based Learning (PBL) – Semester IV. It has been designed and developed on React JS and Material UI to make it efficient and powerful. Other methods to generate notifications, delete notifications, comments and likes have also been created and deployed. The front end has been designed in such a manner that schema of database can be implemented without causing a lot of hindrance to the front end. The design has been developed in such a manner that it is minimal and efficient, hence taking care of UI/UX. With help of JavaScript libraries like React and Redux, a powerful view has been developed which can be easily linked to suitable database.

The front-end views now need to be linked to backend database which will be based on cloud platform. The social web application will generate unstructured data in form of text, numbers and images. It's not possible to hold such data in SQL format hence a NoSQL database will be employed. The database should be such that it provides facility to create, read, update and delete large amount of data. After linking with cloud database, the web application can be hosted over any domain.

REFERENCES

[1] Luren Xiaofie, Zhang Jingxia Wang, Siyuan Tang, Ni Gong2017
[2] Shunji Wakamiya, Kazunobu Yamanchi, Junichi Kiryu, Yuichiro Ogura, Yoshimnne Shiratori 2007
[3] Ilo S.F. Igbajar Abraham, Acholom Joyce C. 2015
[4] Digvijay H. Gadhari, Yadnesh P. Kadam, Prof. Parinneta Suman 2016

Development of Unit Converting Website Using CSS, HTML and JavaScript

Balkrishna Giri
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
balkrishna_09@protonmail.com

Ravikant Dangi
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
Ravikantdangi96@gmail.com

Pavan Gupta
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
pavangupta007@gmail.com

***Abstract*— This work deals with development of android-based application for the conversion of different metrics and cost estimation of software projects. This system can be used by business and educational stakeholders, such as students, software developers, and business organizations. The main aim of the proposed system is to assist the software development team estimate the cost, effort and maintenance of the project under development. Moreover, it assists in applying the different conversion metrics efficiently and easily. The proposed conversion and estimation application comprises of two main modules, namely: (i) conversion (ii) estimation. These two modules are further comprised of sub- modules. The conversion module deals with conversion of different metrics, such as weight, distance, and temperature from one unit to other unit.**

Keywords—Internet Of Things(IOT), IIOT, DHT11, Dust Sensor, Monitoring and Controlling

I. INTRODUCTION

It's impressive what's possible to accomplish with a website today. Web applications look and feel like native applications, but run in your web browser. These web apps require no updates from the user. There is no app store approval process, so when you publish your changes, they are immediately available to visitors. Progressive Web Apps show us the potential for what we can accomplish with a website. Features include faster loading, improved search, offline data storage, multi-device support, and push notifications. But if you're interested in starting web development today, you may be faced by a dizzying array of options. How do you choose from the many tools and frameworks out there? What are the best practices you should be aware of, and common pitfalls to avoid? In this module, we'll show you the basic components of a web application, and the tools you can use to start web development. We'll use HTML, CSS, and Javascript together to build a simple website, we'll use developer tools in the browser to check our work, and we'll use Git to track changes so we can collaborate and recover from problems when they occur. Let's get started by installing the tools we need and setting up our developer environment

II. PROPOSED FRAMEWORK

If you've ever tried converting from minute to second, Square Meter to Square Yard, then you know that it's not an easy thing to do. You'd need to know all the right numbers and be able to multiply them using the correct formula. Even if you' re a mathematical genius, this can be a stressful and tedious task to do. To people who aren't so mathematically inclined, even simpler conversions like changing kilograms to pounds can be confusing. Besides the complication involved in converting units, the task also takes a significant amount of time to complete. Like most people, you'd probably need a pen and a piece of paper, just to get your thoughts together. This can be quite annoying, especially if you need a quick figure, and don't have the time to fiddle with writing materials. One of the most obvious ways to circumvent this is to use a search engine. You could simply search for the formula for converting into the units you want. Unfortunately, even if the search engine processes your query, you still have to do some calculations on your own. The best solution is then to get a tool that contains all the units of measurements, Like Length, Weight, Temperature, Area and can seamlessly convert one to the other.

III. PROPOSED ARCHITECTURE & METHODOLOGY

Proper design has become a critical element needed to engage website and mobile application users. However, little research has been conducted to define the specific elements used in effective website and mobile application design. We attempt to review and consolidate research on effective design and to define a short list of elements frequently used in research. The design elements mentioned most frequently in the reviewed literature were navigation, graphical representation, organization, content utility, purpose, simplicity, and readability. We discuss how previous studies define and evaluate these seven elements. This review and the resulting short list of design elements may be used to help designers and researchers to operationalize best practices for facilitating and predicting user engagement.

TABLE I : INDUSTRIAL DATA

Author name	Year	Description
Lemay Laura	2017	Mastering HTML, CSS & JavaScript Web Publishing
Whitney David	2019	Get Coding 2!
Cardarelli Francois	2013	Scientific Unit Converter

This project was based on using the development of website as an educational means. In order to do so our guide instructed us to create an unit converting website to contribute in educational sector by creating a platform where various ideas and mini projects are displayed for students or in general for anyone who want to save time and in such projects can follow and make. This way or by this method we would combat human error accurately and ensure the youth of tomorrow would have better understanding about the importance of using such converter. We were also instructed to create a user-friendly webpage where visitors who are inspired by our visions and goals could easily contact us and join to ensure a better future.

Fig 1. Data flow diagram

IV. RESULT & DISCUSSIONS

You'll be glad to know that using the unit calculator is much easier than trying to convert the units in your head. Follow these steps to use the unit calculator

Step one: Load the tool. Follow the provided link of unit-converter to open the tools webpage.

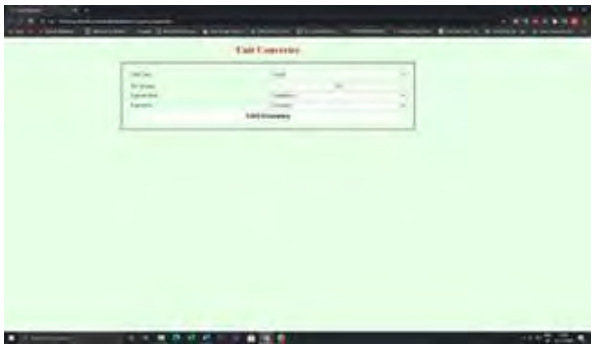
Fig 2. Home Page

Step two: Select your unit of conversion. When you load the tool, you'll immediately see a full list of all the conversions you can do with the tool. Look through the long list of units and select the one you need. Clicking on it brings the tool to the main interface.

Step three: Adjust your preferences. The tool's main interface has two Fields, labelled "From" and "To". Here, click the drop-down options menu below the "From" field to select the unit you are converting from. For example, if you want to convert from Centimeter to Kilometer, you have to first select "Length Converter" in step two. Then, you select centimeter in the "From" drop- down options menu. Since you're converting to the kilometer, you have to select kilometer in the drop-down options under "To" fields

Fig 3.Login Page

Step four: Enter your value.After adjusting your preferences, simply enter the figure you want to convert. Here, you might enter "300" in the "From" field. The tool works in such a way that it converts the figure immediately you enter it. So,it is just as easy to change your preferences.



V. Future Scope

For any business, a website matters more than anything, when it comes to reaching out to customers online. A website is the representation of the business online. These days, every business realizes the need for having a website and are putting in efforts to design and develop the best site for taking their products or services online. This is where we can see a great deal of scope for web development and design. With the tremendous progress in the lauch of websites, people who can create exemplary designs and platforms for their online presence is what businesses are searching for. Web developers and designers are bringing in all the best of their technical expertise and skills to develop and unique design websites that are and capable of pulling the crowd.

VI. Conclusion

In this tutorial, we learned about client- side JavaScript and used our previous knowledge of HTML and Through the tutorial, we learned about many new concepts, especially in regards to using client-side JavaScript to build dynamic web pages. Along the way, you've picked up some new skills: become more familiar with programming in Javascript learn to think through and implement more complex logic utilize the Chrome DevTools for debugging client-side JavaScript We've also go to review front-end basics: building web pages with HTML elements styling HTML elements with CSS using Bootstrap's grid system to layout HTML content. CSS to build a unit converting website

References

[1] Kirkpatrick, Andrew et al. Web Accessibility: Web Standards and Regulatory Compliance, friends of ED, 2006.

[2] Leary, Michael. Web Designer's Guide to Typography Hayden Books, 1997.

[3] Lupton, Lupton. Thinking With Type: A Critical Guide for Designers, Writers, Editors, & Students (Design Briefs), PAPress, 2004.

This page is kept blank intentionally

An Online Student Grievance Support System

Harsh Modi
dept. of Electronics and Telecommunicaton Engineering
Thakur College of Engineering and Technology
Mumbai, India
harsh456modi@gmail.com

Pragnesh Poojary
dept. of Electronics and Telecommunicaton Engineering
Thakur College of Engineering and Technology
Mumbai, India
pragnesh.poojary@gmail.com

Kalp Shah
dept. of Electronics and Telecommunicaton Engineering
Thakur College of Engineering and Technology
Mumbai, India
kalpshah2600@gmail.com

***Abstract*— This paper analyses the effects of Grievance system having problems and faced by every student. A grievance is a discontent or dispute which could arise at any level in any organization. If the organization is an academic institution, then this issue becomes more sensitive and important. Students are the most vulnerable entities at educational institutions often fail to express and sometimes fail to seek proper support for the issues they face arising at numerous levels[1].In colleges if anyone wants to complaint about something we need to write it down on a paper and submit it in complaint box. So for solving this problem we are creating an Online Student Grievance Support System. Here anyone related to college or any other person can just easily login and submit his complaint. This complaint letter will be solved by respective Principal or Admin of this system. In this system the facility of managing User and their data related to their Complaints and their profile is also easy managed. This data can be easily viewed and modified whenever required. This Grievance redressal system (GRS) also provides the functionality of providing a monthly report which will used to maintain information about how many complaints are solved in a particular month. It also provides the validation of Users[2].The existing system has manual processing through committee, principal, concerned departments and AICTE. The proposed system had capable to complete the process automatically by using our application.**

Keywords— Validation, Student Grievance, Profile, User, Grievance Redressal System (GRS)

I. INTRODUCTION

A grievance is an oppressive state of things caused due to any wrong or hardship suffered by an individual which forms legitimate grounds of complaint and the complaint demands a remedial action. Grievance redressed mechanism is a part of the prevalent machinery of any administration. Redressal of the grievances is considered as a parameter to measure the efficacy of an organization. No organization can claim to be responsive and user-friendly unless it has established a well-versed system of grievances/complaints redressal. A redressal mechanism would cover complaints of not only a refusal to the return of documents or certificates, any irregularities in the admission process, but also complaints regarding harassment and victimization including harassment. We are developing an online complaint Management System for submitting complaints online by using complaint Management System a user can upload/post his complaint from anywhere by using this website on his phone or PC Online. Complaint Box is easy and secure way as compare to other previous methods. Due to an online compliant box manual effort and wastage of paper is decrease. User can submit his complaint by easily creating his/her own profile also User can check the current status of their complaints and can view that what kind of action is taken of his/her complaint. Online complaint Management System shows the current status of the complaint that whether it is in processes or closed. It is based on centralize management only the admin can check or solve the complaint. Admin having the authority to remove a User. Centralized management for checking current status of complaint and updating status of complaints. Admin can generate a report of this system in between selected date of his own choice. A typical grievance redressal system (GRS) is shown in Fig. 1, and it works functions for several purposes including ensuring a democratic campus environment, acquainting all the faculty and students about their rights thus ensuring qualitative as well as the quantitative development of the organization. Moreover, considering the nature of and the severity of the grievances, the due inquiry is made by the members of the cell, followed by giving punishment if anyone is found guilty. Complaint Box is easy and secure way as compare to other previous methods. Due to an online compliant box manual effort and wastage of paper is decrease. User can submit his complaint by easily creating his/her own profile also User can check the current status of their complaints and can view that what kind of action is taken of his/her complaint.

Online complaint Management System shows the current status of the complaint that whether it is in processes or closed. It is based on centralized management only the admin can check or solve the complaint. Admin having the authority to remove a User. Centralized management for checking current status of complaint and updating status of complaints. Admin can generate a report of this system in between selected date of his own choice.

II. OBJECTIVES

The objectives of the website are-

- To reduce paperwork
- Reduced operational time
- Increased accuracy and reliability
- Reducing human efforts
- Easy maintains of Data

- Data security

III. LITERATURE SURVEY

Firstly, we have studied the current system available for complaint collection in college and also meet the principal of college for collecting there requirements. Then we also studied various website which were providing some relevant features.

In the literature, time to time reporting is available regarding demand and usage of GRS for various domains such as e-governance, public administration, Municipal Corporation, ragging offenses in student community, and sexual harassment in an organization. The key observations during the literature survey are enlisted below. In [1], analysis of various online services provided by, specifically four Indian states, has been presented and the importance of online grievances redressal mechanism is highlighted to combat corruption in the bureaucracy. Various metrics associated with the GRSs have been taken into account, and a scale has been devised. The performance of the states into consideration has been measured on the scale. Dipankar [2] explores the utility of complaint registration system in India. Fear of revealing the identity makes complainant go anonymous or pseudonymous. It becomes a tough job for the authorities to know the authenticity of the complainant. Therefore, the solution is presented so that complainants can complain being intrepid, at the same time allowing the authorities to examine the originality of the complaints. In [3], redress procedures are said important for basic fairness. Effective functioning of the system is possible when both demand and supply sides work well. Using the analyzed facts and information, we propose some additional features and attributes to fill the aperture in the current system. There have been various researches done and papers available on GRSs but all of them are for public sectors companies, municipal corporations, and e-governance systems or contain only one or two of the problems faced by the students in the educational institutions but none of them include each and every domain of grievances related to students. In addition to that, many systems lack in proper channelization of complaints to solve them in time with proper understanding and solution. There is also a need for more transparency and guaranteed solutions. There has no work been done specifically in the domain of problems faced by students in the educational institutions, especially in India. So, there is a need for developing a system that is robust, transparent, and fair and allows fast and reliable solutions to each and every problem faced by the students. Thus, the communication gap between the students and the system may be managed by an automated system of GRS, where students generally are unaware of their rights and hence do not know what to do and what action to take at the time of difficulty or trouble. This lack of information and unawareness among the students is only due to the hazy way of working. At times, students do not want to reveal their identities due to the severity of complaints or afraid of being harmed, and there is no such provision available in the current systems of various educational institutions in India.

IV. CONCEPTUAL FLOW OF DATA IN GRS

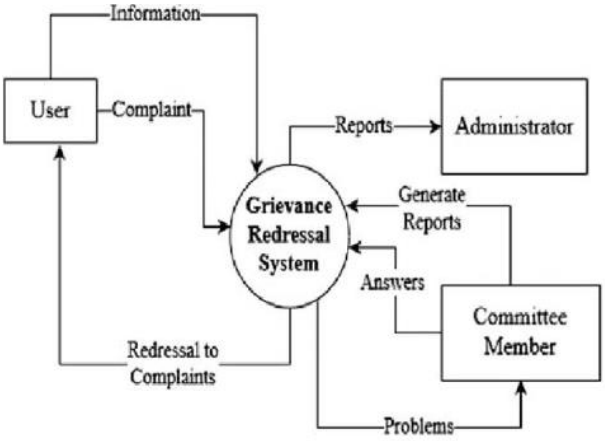


Fig. 1. Context flow of grievance redressal system

To develop a working GRS, the flow of data from on component of the system to other is depicted by Fig. 1.

V. SYSTEM ARCHITECTURE

This website can be readily used by non-programming personal avoiding human handled chance of error. It is a easiest and secure way of submitting an complaint. This project includes two modules.

1. User
2. Admin

User can create their accounts and can complaint there problems and also can see action taken on their complaint. User can check the status of current and also previous complaints. User can submit his or her complaint by an easy registration. Existing user can submit complaint by using their registered user id and password. Admin can check the complaints also can take action on it. Admin also having the authority to remove the user. Admin can check the monthly report generated by system. New features can be added as per requirements.

VI. PROBLEM DEFINITION

We have analyzed the working of current systems, what facilities being provided to the students, and how their grievances are being redressed in various educational institutes and found where they lag or fall behind.

1. Using the analyzed facts and information, we propose some additional features and attributes to fill the aperture in the current system. There have been various researches done and papers available on GRSs but all of them are for public sectors companies, municipal corporations, and e-governance systems or contain only one or two of the problems faced by the students in the educational institutions but none of them include each and every domain of grievances related to students.
2. In addition to that, many systems lack in proper channelization of complaints to solve them in time with proper understanding and solution. There is

also a need for more transparency and guaranteed solutions

VII. PROPOSED METHODOLOGY

To design and implement GRS, the entire process is divided into study and analysis phase and design phase. The former phase includes the development of questionnaire made to know the facilities and problem encountered by the student in 44 S. Prajapatet al. different institutions. In the design phase, identification of the entities and their relationships is done along with designing numerous UML diagrams of the proposed system. The logical model of the system has been designed, normalizing the relations. Data flow diagram of the whole system has been constructed. Flowchart of each process of DFD is constructed for better flow of data and its verification (included in project report). The proposed model is the physical design of the system defining the software and hardware requirements. The coding phase may be considered as a deployment stage for GRS. The design of the system is implemented through actual code. Proper validation of data is used. Proper validation on important fields is provided. The user does not need to have the knowledge of the code, and the output is defined user-friendly. Testing phase can also be followed on various test cases and data set. Testing could be done by taking different use cases. A record is updated every time a student enters details. Update when a complaint is registered. Records are managed when a student checks the complaint status.

VIII. NOVELTY IN PROJECT

The aim of the proposed SGS is to address the issues present in the current system, Implement validation techniques that will help reduce the margin of error in operations, providing adequate data backup facilities in order to ensure system restart even after a calamity and ensures consistency. It is a foolproof system that simulates and replaces the present manual system.

IX. PROS & CONS

The pros and cons of the proposed GRS system primarily includes human negligence since the system, though an automatic prototype to redress the complaints of the students/victims, will be handled by humans who could be negligent at times in forwarding complaints to the respective committee member or while providing solutions to the respective administrator.

Another shortcoming includes a poor network which could persist at times; as a result, the system of forwarding and resolving the complaints in the form of sending back the answers to the respective administrators and then to the respective students could get delayed, the proposed GRS system being based on simple mail transfer mechanism.

X. FUTURE ENHANCEMENTS

The GRS working on the pretext of the grievance redressal for the students currently works as a Web application among the various members and the targeted audience.

To extend this further to fulfill various requirements, following enhancements are suggested: (1) Though many future enhancements of the system worked upon are possible, the prime focus includes the development of a mobile application in order to increase the mobility of the application since the future demarcates the usage of mobile applications and as seen portable devices are ubiquitous which will facilitate the receiving of all the notifications in the cell phone by the members Fig. 4 Context flow of grievance redressal system A Prototype for Grievance Redressal System 47 and students associated with the application further increasing the reliability of the system and the rate of problem-solving. (2) The mobile application is targeted to enhance the user experience by providing the user with additional features for uploading the pictures the proofs in the form of audio or video files, which might enhance the case solving ability especially in such cases with a high rate of severity. (3) A toll-free helpline could be made available on a 24 7 basis for the victims in order to lodge complaints at emergency hours or to seek counsel in case of catastrophes. (4) Above all, a tracker could be added as a part of the future perspectives in order to track the performance of various committee members involved into the process on the pretext of the provided feature of the report generation.

XI. CONCLUSION

This paper is an attempt to highlight the fact that there are hardly such systems prevailing curtailing to the complaint redressed for students enrolled in numerous organizations. This paper has demonstrated a proposed SGS system for the grievance redressed of students covering various domains of complaints which could be lodged easily and thus leading to easy and sure solutions or redressed to the problems being faced by a student on a regular basis. The design is a user-friendly graphical user interface. This system would be suitable for any organization for the resolution of complaints and thus lead to a qualitative and quantitative development of the organization. This was a brief overview of Complaint Management System for College. This website is mainly designed to reduce the manual efforts and receive all complaints about college and also for providing the current status of complaints and managing data of complaints and make the work easier for users and the complaint solvers. This was a brief overview of GRS for College. This website is mainly designed to reduce the manual efforts and receive all complaints about college and also for providing the current status of complaints and managing data of complaints and make the work easier for users and the complaint solvers.

REFERENCES

[1] Shaligram Prajapat,"A Prototype for Grievance Redressal System",15 May 2018

[2] Mukesh Buldak1, Shrikant Pandhekar2, Afzal Gigani3, Amreshsinh Kachwah4, Kundan Patil5 Poonam Polshetwar6, Pradeep Jadhav7,"AN ONLINE GRIEVANCE REDRESSAL SYSTEM"Volume: 06 Issue: 03 | Mar 2019

[3] Varun, G.: Redressing grievances and complaints regarding basic service delivery. World Dev. 41, 109–119 (2013)

[4] Nripendra, P.R., Yogesh, K.D., Michael, D.W., Vishanth, W.: Investigating success of an e-government initiative: validation

of an integrated IS success model. Inf. Syst. Front. 17(1), 127–142 (2015)

[5] Rajesh, K.Y., Sarvesh, M.: Role of insurance ombudsman and grievance management in life insurance services in Indian perspective. Int. Lett. Soc. Humanist. Sci. 31, 9–13 (2014)

[6] Gianluca, M., Karin, P., Javier, M., Rahul, D.: Openness May Not Mean Democratization-e-Grievance Systems in Their Consequences. 14th N-AERUS and GISDECO, University of Twente, The Netherlands (2013)

[7] Maharashtra State Police e-Compliant Registration System (http://gms.maharashtra.gov.in/CMS/)

[8] Misha, P.M., Sunny, R., Rahul, S., Shaligram, P.: Challenges associated with automation of NPO: requirement engineering phase. In: Qi, E., Shen, J., Dou, R. (eds.) Proceedings of the 21st International Conference on Industrial Engineering and Engineering Management 2014. pp. 665–669. Atlantis Press, Paris (2015)

[9] Singh, C.P..: Ragging: a human rights abuse. Indian J. Dev. Res. Soc. Action 7(1–2), 17–30 (2011)

[10] Bonnie, S.F., Francis, T.C., Michael, G.T.: The sexual victimization of college women. Research Report. National Institute of Justice, Department of Justice, Washington, DC. Bureau of Justice Statistics (2000)

Design And Development of Website on Different Ailments and Its Home Remedies

Ashish Pandey
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology Mumbai, India
pandeyashish157@gmail.com

Ami Patel
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology Mumbai, India
amipatel0610@gmail.com

Jaaee Rahate
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology Mumbai, India
jaaee1013@gmail.com

***Abstract*— Home remedies for ailments came to evolve over the centuries due to the absence of modern medicine and the paucity of doctors. Their effectiveness led them to be spread by word of mouth through generations. Made of routinely used and easily available materials, these remedies offer a cure for simple ailments and at times help to tide over critical periods. Now days, Life is so fast and busy that we do not get much time to go to the doctor for treating ailments and we ignore our problems which later on may become the bigger one. But with the advancement of technology, we can find a cure of our day to day health problems with the help of the internet as internet is widely used source of information for the patients searching about the information and which prove to be home remedies guide for us**

Keywords—Ailments, Health, Home Remedies, Cure, HTML, Side effects, CSS.

I. INTRODUCTION

When it comes to tummy bugs, headaches and nausea, or some other ailments there's often nothing more effective than the treatment Mother Nature can provide. So instead of running to the chemist, turn to one of these genius natural home remedies to nurse you back to health. As well as public interest in finding an alternative is because of increased side effects of modern drugs as well as high cost of this medicine. Home remedies are best used before rushing to a doctor for minor ailments as they are easy to prepare and have virtually no side effects besides the occasional allergy which is in contrast with modern medicine that has its own side effects and has to be taken for a specific period. One remarkable aspect about home remedies is that they offer immediate relief with a minimal dose.

II. PROBLEM DEFINITION

There is not every time necessity to go to the doctor for small ailments. Small ailments can be treated at home as well by using the products available in our kitchen if we have proper information about them. But now a day all don't have the information about the same. As we know that the allopathic pills though show immediate results, but also show side effects in the long run. Therefore, taking pills for small ailments such as headache, indigestion, stomach ache isn't a good practice. Instead of taking pills every time, we can make use of products such as turmeric, ginger, Dhania, Methi etc. as conventional medicines and by using these products we can treat small ailments at our home itself.

III. MOTIVATION

There are many people who are affected with some ailments and are not able to visit their doctor or don't have enough time, or they don't have enough money to buy those expensive modern medicines. And even we have used some or the other home remedies in our life told by our elders. This is what gave us the motivation to build such a website will help people in saving time as well as money and one can get all the required information about home remedies from this website.

IV. LITERATURE SURVEY

Ronald B. Turner in his paper "Studies of natural remedies for common cold: pitfalls and pratfalls" commented that the Current treatments for the common cold are limited to symptomatic therapies. First-generation antihistamines and adrenergic agents are modestly effective for rhinorrhea and nasal obstruction respectively, but their usefulness is diminished by side effects. All the information provided was worth to follow in order to go for home remedies.[1]

"Treatment Of Diarrhea Using Traditional Medicines: Contemporary Research In South Africa And Zimbabwe" written by Alfred Maroyi in his paper he wrote about Gastrointestinal disorders, diarrhea in particular remains a major concern in South Africa and Zimbabwe resulting in high mortality rates when left untreated. This investigation was aimed at documenting herbal medicines used in the treatment of diarrhea in South Africa and Zimbabwe. And also wrote about many home remedies for diarrhea and gases. All the remedies suggested were not possible to get all the stuff

inside our house. But the information provided is worth of value.[2]

In "Concise Review: Herbal remedies for the treatment of nausea and vomiting" written by Azam Mohsenza deh, Shokoufeh Ahmandipo ur, Parmida Shakarami and Parisa Rahmani wrote about vomiting occurs when the contractions of stomach muscle walls cause a large amount of the stomach content to go upward and flow back into the esophagus; this process is very common among infants. The aim of this review was to present the effects of medicinal plants on vomiting. And also wrote about some useful remedies for vomiting and nausea, headache etc.[3]

V. PROPOSED DESIGN

The proposed design is based on minimalist approach to UI/UX. The front end is designed in such a manner that users won't face any kind of difficulty in locating the options. The proposed system uses features of React JS library that are open source.

It incorporates CSS design and Material UI features to provide aesthetic to the web application. While the project will be designed on free cloud storage that is offered by Firebase but to convert it into large-scale, a client will be required to purchase the cloud storage as per cost determined by Firebase Inc. As the number of users increase, the amount of data to be stored, processed and update will increase tremendously. Hence major chunk of cost involved in project will be purchase of cloud storage.

The basic approach was to design the front end in such a manner that it supports good UI/UX simply by help of open source technology. The cost of project increases when length of code increases i.e. human resource utilization is more. This was taken care by using React JS library that reduces the length of code and still supports development of powerful dynamic web applications. ReactJS being open source further eliminates the cost of production and design. It uses CSS based on Material UI to give aesthetic UI to the user. The major objectives involved in project planning are listed as follows -

i. The front end should be designed in a minimalistic approach such that database can be designed on basis of that without doing any kind of alteration in front view.

ii. The front view should be based on open-source tools hence only human resource cost should be involved in development.

iii. The front end should be efficient to handle user interaction with backend.

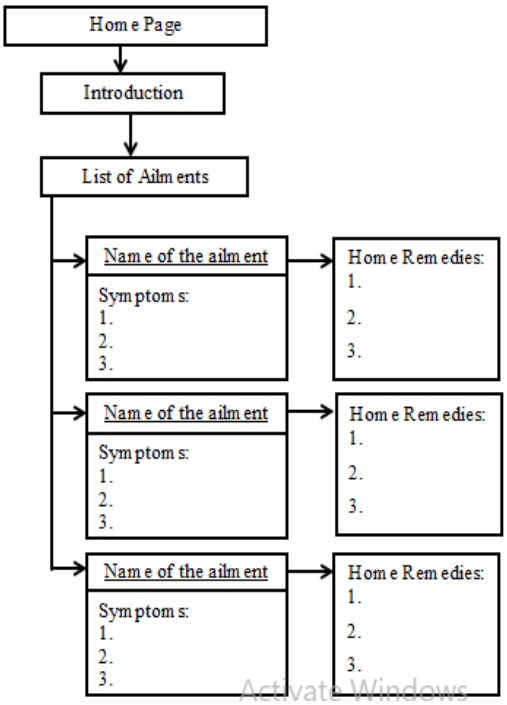


Figure 1. Data flow diagram

VI. RESULT & DISCUSSIONS

This project is aimed at developing a website which will provide basic information about home remedies. Various ingredients available in our kitchen can be useful to cure some small ailments such as indigestion, acidity, headache etc. On the home page at the top there is the title of our site and some information about home remedies.

Figure 2: Home Page

The Home Page shown in figure 2, is the default page of the web application. It will show various there is a list of ailments with few of the common symptoms. When the user clicks on the button provided, it takes the user to respective page of the ailment.
After clicking on the name of the ailment, the button provided takes the user to the respective page. On that page, the user finds home remedies associated with the ailment.

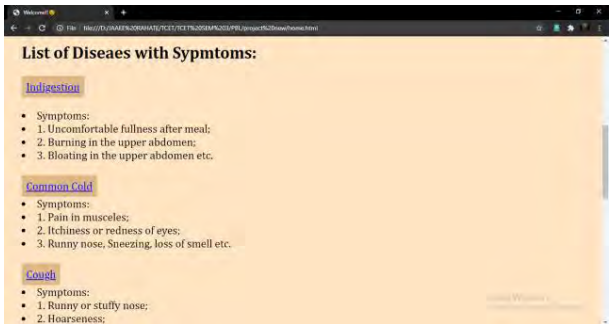


Figure 3: List of Diseases with symptoms

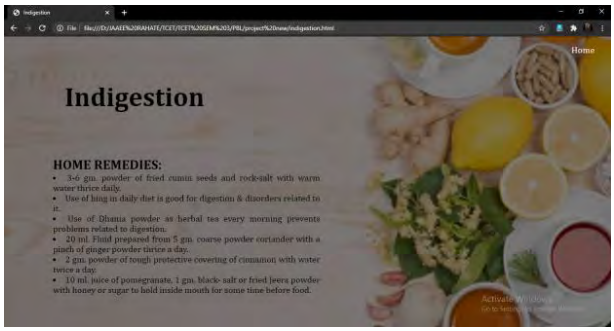


Figure 1: Indigestion home remedies page

In the navigation bar there is link to go back to the home page.

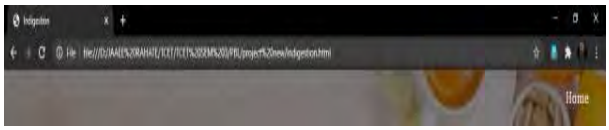


Figure 2: Link to go back to the home page

VII. SCOPE OF PROJECT

Primary prevention and promotion of good health is needed for everyone. Nowadays, the cost of health care is constantly rising, and affecting people's ability to afford health coverage. The drug should be the last rather than first mean of treatment of ailments, rather beginning with the natural healing method like Home Remedies is a good option. But even for using Home Remedies one should have proper information about the it and the ingredients as well. So, for that one can visit our website and get all the information required to treat their ailments.

VIII. CONCLUSION

The front end of the web page has been successfully completed under Project Based Learning (PBL) – Semester III. It has been designed and developed on Visual Studio Code to make it efficient. This project was successfully implemented with all the features mentioned in the system requirements specification. The static part was built using VS Code. Currently the website is only providing home remedies of commonly found ailments. New ailments and home remedies can also be added as per user requirements. Also new features and enhancements can be added into the website as per user requirements.

REFERENCES

1. Studies of "natural" remedies for common cold: pitfalls and pratfalls; Ronald B. Turner; 2005 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1266329/

2. Treatment of Diarrhea Using Traditional Medicines: Contemporary Research In South Africa And Zimbabwe; Alfred Mayori; 2016 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5412201/

3. Concise Review: Herbal remedies for the treatment of nausea and vomiting; Azam Mohsenzadeh, Shokoufeh Ahmadipour, Parmida Shakarami and Parisa Rahmani; 2018

4. JavaTPoint, CSS Tutorial, https://www.javatpoint.com/css-tutorial

5. JavaTPoint, HTML Tutorial, https://www.javatpoint.com/html-tutorial

This page is kept blank intentionally

Malady Detection on Plant Leaves Using Unsupervised Learning Algorithm

Pushya Chaparala
Department of Computer Science and Engineering
Vignan's Foundation of Science and Research
(Deemed to be University),
Vadlamudi, 522213,
India
pushyachaparala@gmail.com

Siva Shankar Rao
Department of Computer Science and Engineering,
Guru Nanak University,
Ibrahimpatnam,501506
India
sivasankarssr@gmail.com

***Abstract* — Plant Pathology role is important in agriculture. We proposed a solution by referring many existing approaches that use the machine learning to detect the "Late blight" pathogen on the leaves. For this, we created a database to train our system. A plant leaf image will be taken as an input for this proposal, this image will be filtered, enhanced, and segmented to produce a binary image. To acquire a good classification results we used K-means, whereas for texture analysis co-occurrence distribution method is used.**

***Keywords* — Pathology, K-mean Cluster Algorithm, Image Segmentation, Binary Image, CCM**

I. INTRODUCTION

Environmental factors play a great influence on plant diseases. Plant cells have special signposts that protect against disease-causing agents. For thousands of years, humans are cultivating selected plants for live hood, medicament, and garments, and this choice is done based on profit.

When plants are taken out to abnormal conditions (created conditions) from their natural environmental conditions they are easily prone to diseases. Compared to wild relatives cultivated crops are more susceptible to malady.

Plant diseases are studied as part of plant pathology. Based on the nature of the primary causal agent, plant diseases are broadly classified into Infectious (Biotic) and non- infectious (Abiotic). Infectious plant diseases are caused by pathogens like bacterium, a virus, nematode, fungus, mycoplasma. Biotic diseases may originate within the plant and can also be transmittable from one host to another. Non-infectious diseases origin due to abnormal factors like high temperature, toxicant material in their ecosystem and surplus or scant in an essential nutrient. In nature, multiple disease-causing agents may affect plants at a time. The complexity of a disease increases with the combination multiple pathogens.

To recognize plant diseases, one must have the knowledge of the plant living habit characteristics and family origins. Chronologically we can see the upsurge in the plant diseases that leads to hunger, starvation, famines, and mass migrations. History records even show economic impacts on various consumer groups because of these plant diseases.

With the help of emerging technologies, we can overcome the above-listed problems. This paper proposes the use of the K-means algorithm for classification and identification of leaf diseases. Section II provides a survey of different existing plant disease identification techniques. Section III proposes the system methodology, while section IV shows the experimental setup with results to support the conclusion provided in Section VI.

II. LITERATURE SURVEY

Identifying and preventing the crop from diseases have a direct relationship with the country's Gross Domestic Product (GDP). To increase the productivity of crops one must use the knowledge of identifying plant diseases. Farmers can easily identify the well-known diseases, but if it is beyond their ability, they will look for expert knowledge.

Many solutions are being offered to support the farmers to reduce the time complexity in identifying the diseases.

Yin Min O [1] proposed a methodology for the detection of classic plant diseases in Myanmar agriculture fields, by using digital image processing techniques. They used K- mean clustering and SVM for the classification and detection of the listed plant leaves diseases.

Nikos [2] proposed a mobile application for the diagnosis of plant diseases. As per Nikos, recognition of diseases at an early stage can provide better prevention, especially lesion. This system requires a plant leaf image with a lesion as an input, it uses spot recognition technique to extract the properties of the leaves that helps to determine a conclusion on the condition of plants.

Padmavathi [3] shows that RGB images are more reliable than Grayscale when it comes to the identification of plant diseases. For this they used a nonlinear digital filtering technique for the removal of noise and segmentation for the extraction of a disease portion.

Computer Vision can be better aided when it comes to the identification of plant diseases, so Isaac Kofi Nti [4] proposed a system based on it. He used the Gaussian smoothing operator for image smoothening by

removing higher frequencies details and noise. This enhanced picture will be further processed for segmentation to extract the classification of diseases.

Saradhambal. G[5] designed a solution for noticing the plant diseases, for this he used a color-based segmentation model and an enhanced K-mean clustering algorithm for processing to classify classes of diseases. This software is designed with a voice navigation system, so a novice user can also use it easily.

Guiling Sun [6] application used improved tonal distribution method and enhanced segmentation model for the separation of lesions accurately. The authors also took the advantages in the linear regression model for the better classification of diseases.

S. Aryabhata [7] designed an application to identify the plant diseases with the help of Color-co-occurrence methodology. An input image will be converted into HIS format from that green pixels are masked and removed, that image will undergo the segmentation process. As for the final steps they used Color-Co-occurrence methodology and neural networks to compute texture features and classification.

Praveen [8] used a blended approach for effective detection of plant disorder, here the authors used the Support Vector Machine (SVM) for the classification of Plant diseases, for this they used MATLAB.

Vijai Singh [9] included surveys on different plant detection solution, with that study he proposed an algorithm for the effective classification of plant leaf malady.

An inexpensive disease detection system for grape leaves was proposed by Pradnya Ravindra narvekar[10]. Along with the image segmentation model he used texture statistics to evaluate the presence of disease on the plant. This system is specifically designed to assist farmers.

Piyush Chaudhary [11] proposed a color transformation technique for disease spot detection on a leaf. For this first, he collected an image database with .JPEG extension. Each image from this collection will be converted into any of the three models YCbCr Color Model, HIS Color Model - CIELAB Color Model, Once the images are converted, they will be processed into Image smoothing and disease spot segmentation based on the model. Based on the results, a comparison will be done to identify the best color model for disease spot detection.

Mrunalini [12] proposed an application with K-means clustering for detecting crop diseases along with artificial intelligence in Pattern Recognition. Initially, they pre- process the images that are acquired by using the methods like clipping, smoothing, and enhancement.

The output of pre-processing will be sent to Image segmentation and further the step proceeds to the extraction of features and the classification of diseases, for this they used Neural networks and fuzzy logic.

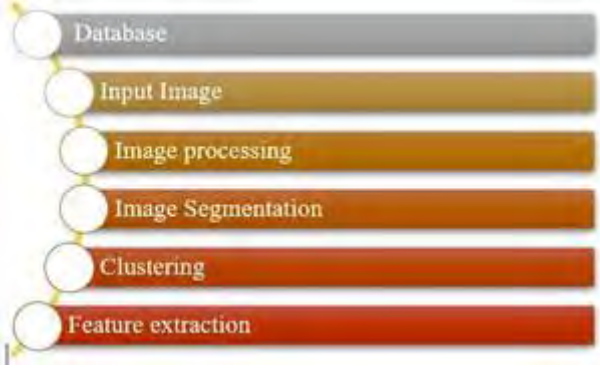
III. PROPOSED METHOD

In this section we discuss the process workflow along with the techniques used.

Process Steps

This solution involves the following steps:

i. Database
ii. Input Image
iii. Image Processing
iv. Image Segmentation
v. Applying Clustering Algorithms
vi. Features Extraction



Description

Database

This solution started by creating a plant leaf's database that is used for training and testing. This database is the collection of .JPEG format.

Input Image

Input image must be captured without direct sunlight, or else the output will be affected. During this, any leaf image in or outside of the database is often tested by the ANN that we have trained.

Image processing

Since images are from the real field, they might contain a lot of unwanted pixels which require a pre-processing. This technique helps to improve the quality of a picture by getting rid of the unwanted distortion.

The noise cancellation method is used for the image enhancement, it will correct the pixel values, to improve the quality of the picture. As a part of the process, it will delete and separate the background into the black, later the additive colors are removed and transformed into a HSB image.

Image Segmentation

Here images will be divided and assigned to multiple labels for a better identification of characteristics. Out of many here we are using the threshold-based segmentation technique, which uses a threshold value to flip an image into its binary format.

Identified green color pixels are masked and its intensity are measured to compute against the defined threshold values if the value is less than the predefined then red, green, blue pixels are set to zero. Segments that helps to classify leaf diseases must be collected by deleting the masked cells

Applying Clustering Algorithms
Here we use the K-means algorithm for clustering and classification of images.

Features Extraction
Unique feature must be obtained from the uploaded image by considering both the color and texture properties. For this, we used the Color Co-occurrence method CCM

Techniques used
K mean clustering:
This method uses iterative unsupervised learning algorithms for the classification of objects.
An objective function used here is

$$P = \sum_{i=1}^{k} \sum_{j=1}^{n} ||y_j^{(i)} - c_i||^2 \text{ ---------(1)}$$

Where $||y_j^{(i)} - c_i||^2$ is the chosen absolute distance between a data point $y_j^{(i)}$ and the cluster c_i
Algorithm:
1.Select the number of clusters "K" from the given data.
2.Randomly select distinct points based on "K" in space.
3.Measure the distance between the identified points with all the "K" based distinct points.
4.Consider the shortest distance to choose the cluster.
5.Repeat Step 3 and 4 for all the points in the data to identify their clusters.
6.Calculate the mean of "K" based clusters.
7.Rearrange all the "K" points in space to repeat Step 3,4,5,6
8.Finally, consider the optimal mean value "K" points from space.
Color Co-occurrence Method: It helps to perform analysis on the texture of an image. An input image matrix will be converted into the CM Matrix to identify the unique features of the given input.
Algorithm:
1.Select an image
2.The Input image will be converted into its relevant matrix.
3.Draw the grid, based on the input image matrix for the computation of the CM matrix.
4.The occurrence count of the relation i,j will be checked horizontal with an angle perception.
5.The Count will be placed in the grid
6.Repeat 4,5.
7.The Co-occurrence matrix of the input image will be created successfully, and it is further used for the extraction of unique features.

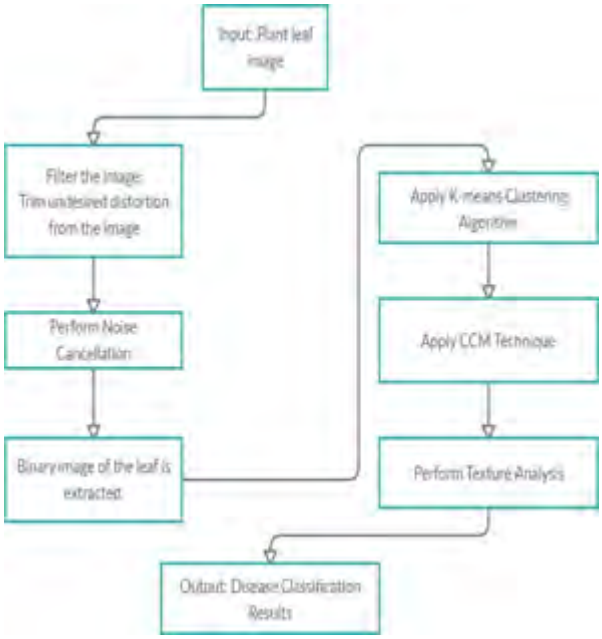


Fig-2: Block Diagram

IV. EXPERIMENT SETUP AND RESULTS

For this experiment, we have used different family leaves and the detection accuracy rate is 90%.

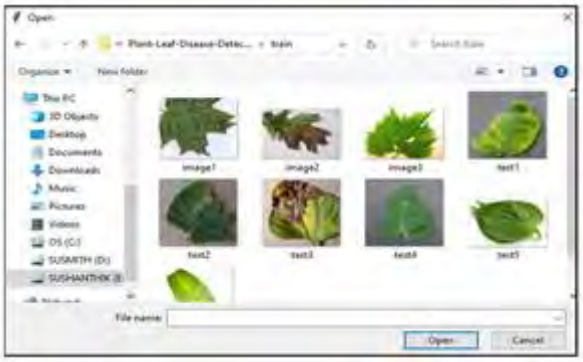


Fig-3: Input Page: Select an image for the detection of disease

Fig-4: Leaf image after performing various image processing techniques

Fig-5: Health Status of selected image

V. CONCLUSION AND FUTURE ENHANCEMENT

This system is designed to automatically identify the plant disease when we upload an image of a plant leaf. For this, we have chosen K-means clustering and co-occurrence distribution for grouping and analysis on texture. In the future, we will enhance our system better by adding more pathogens under the detection list along with a good accuracy rate.

VI. ACKNOWLEDGMENT

The authors would like to thank everyone, just everyone!

REFERENCES

[1] Y. M. Oo and N. C. Htun, "Plant Leaf Disease Detection and Classification using Image Processing," Int. J. Res. Eng., vol. 5, no. 9, pp. 516–523, 2018, doi: 10.21276/ijre.2018.5.9.4.

[2] N. Petrellis, "Plant disease diagnosis based on image processing, appropriate for mobile phone implementation," in HAICTA, pp. 238–246.

[3] Padmavathi and K. Thangadurai, "Implementation of RGB and grayscale images in plant leaves disease detection - Comparative study," Indian J. Sci. Technol., vol. 9, no. 6, pp. 4–9, 2016, doi: 10.17485/ijst/2016/v9i6/77739.

[4] I. Kofi, G. Eric, and Y. Samuel, "Detection of Plant Leaf Disease Employing Image Processing and Gaussian Smoothing Approach," Int. J. Comput. Appl., vol. 162, no. 2, pp. 20–25, 2017, doi: 10.5120/ijca2017913260.

[5] Saradhambal.G, Dhivya.R, Latha.S, and R.Rajesh, "Plant Disease Detection and its Solutions using Image Classification," Int. J. Pure Appl. Math., vol. 119, no. 14, pp. 879–884, 2018.

[6] G. Sun, X. Jia, and T. G. Nankai, "Plant Diseases Recognition Based on Image Processing Technology," J. Electr. Comput. Eng., vol. 28, p. 7, 2018, doi: https://doi.org/10.1155/2018/6070129.

[7] S. Arivazhagan, R. N. Shebiah, S. Ananthi, and S. Vishnu Varthini, "Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features," Agric. Eng. Int. CIGR J., vol. 15, no. 1, pp. 211–217, 2013.

[8] I. Praveen, "A Blended Approach for Effective Detection of Plants Disorder," Int. J. Res. Appl. Sci. Eng. Technol., vol. 7, no. 3, pp. 1395–1398, 2019, doi: 10.22214/ijraset.2019.3255.

[9] Singh and A. K. Misra, "Detection of plant leaf diseases using image segmentation and soft computing techniques," Inf. Process. Agric., vol. 4, no. 1, pp. 41–49, 2017, doi: 10.1016/j.inpa.2016.10.005.

[10] P. Narvekar, M. M. Kumbhar, and S. N. Patil, "Grape Leaf Diseases Detection & Analysis using CCM Method," Int. J. Comput. Eng. Appl., vol. VI, no. Ii, pp. 3365–3372, 2014.

[11] P. Choudhary, A. Chaudhari, D. A. N. Cheeran, and S. Godara, "Color Transform Based Approach for Disease Spot Detection on Plant Leaf," Int. J. Comput. Sci. Telecommun., vol. 3, no. 1, pp. 65–71,2012,[Online].Available: tp://www.bioinfo.in/contents.php?id=48.

[12] M. R. Badnakhe and P. R. Deshmukh, "An Application of K-Means Clustering and Artificial Intelligence in Pattern Recognition for Crop Diseases," Int. Conf. Adv. Inf. Technol. With Work. ICBMG 2011, vol. 20, pp. 134–138, 2011.

COVID-19 Spread Analysis

Atif Khan
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
atifkhan2623@gmail.com

Sanjana Mishra
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
sanjanam740@gmail.com

Mansi Mistry
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
mravi1lad@gmail.com

Dr. Payel Saha,
Professor
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
payel.saha@thakureducation.org

***Abstrac t*— Coronavirus Disease (COVID-19) was identified in early December 2019 in the city of Wuhan, China. The virus had spread in large numbers, making a million cases by mid-March 2020 and about 72 million cases had been registered till date, around the world. The effective preventive measures, given by WHO is wearing a mask, applying sanitizers at intervals, maintaining social distancing, Lockdown etc.. The project was a result of investigating the problem of modeling of novel coronavirus (COVID-19) spread in the constrained or practical scenario in India and around the World. The project shows how deep the impact of COVID-19 is, on the World and on India. It studies the efficiency of the prevention techniques to control the spread of COVID- 19 mathematically and proposes a new mathematical model to predict the new cases or total infected cases in a practical scenario.**

Keywords—Coronavirus, Covid-19, Pandemic, Lockdown, Precaution

I. INTRODUCTION

The COVID-19 pandemic was started in December2019 through China. Gradually, this virus has spread all over around the World, and still, its transmission is going on. The World economy has been disrupted and everyone gets bogged in this crisis. International transportation, tourism, import, export, and all other sectors across the world have been stopped. So, after seeing this situation we came up with the idea that everyone should be aware of the cases for a particular region. We created a live dashboard to indicate the COVID-19 cases of Indian states and every country as well. It will help each and every organization to analyze the situation for a particular region. This project will also help the Ministry of Health to analyze the pandemic and to which extent it will affect the country.

II. METHODOLOGY

This python-based project uses different modules like Folium, Flask, Pandas, NumPy, Beautifulsoup, etc. The project required live data of the number of cases confirmed, active, recovered, and the number of people who died in World and India which was obtained using web scraping of the relevant websites [4][5] and saved as DataFrames using Pandas library. The project is planned to integrate a world map and represent the impact of the virus using a red circle, where the radius of the circle is proportional to the number of cases in the country/state and is calculated using appropriate equations using the NumPy library. The integration of the maps is possible because of the Folium Library. The final part of the project, the assembly i.e. a web page showing all necessary information was carried out using the Flask library.

1. FLASK

Flask is the package used to build small web applications. It does not require any external libraries. Flask provides us with the tools, libraries and technologies that allow us to build the web application. The web application can be some web pages, blog, commercial websites etc. It has some pros like there are little dependencies to update and watch for security bugs.

2. FOLIUM

Folium is a package which is used to visualize geospatial data. Plotting maps using folium is so easy as it takes location parameters in terms of latitude and longitude and accordingly generates the map. It enables the binding of data with a map for Choropleth visualization. It also supports GeoJSON file to create Choropleth with color schemes.

3. NUMPY AND PANDAS

Numpy is the package used for the scientific computation in Python. It provides multidimensional array objects for n-dimensional homogeneous data types.

III. RESULT

In the dashboard created, the visualization of the region-wise effect in India and countrywide effect on the World of the COVID-19 is evident. The project was a success in the integration of maps and depicting the effect of the virus on the world. Additional information like the total cases, active cases, number of deaths is also shown on hovering upon the country. An in depth study of the mentioned python modules required was done and effectively used in the project.

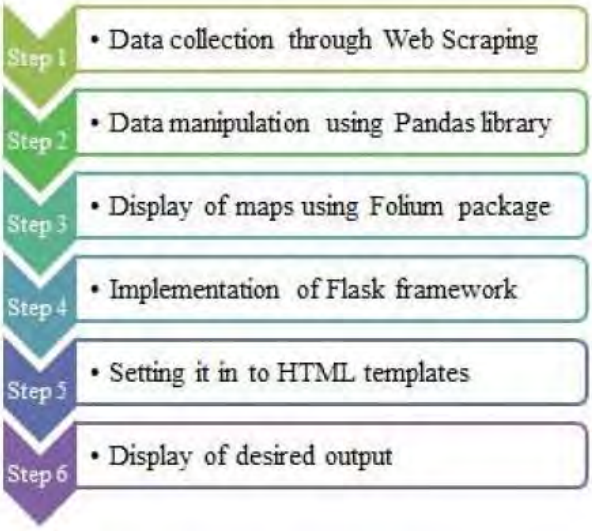


Fig.1. Flow Chart

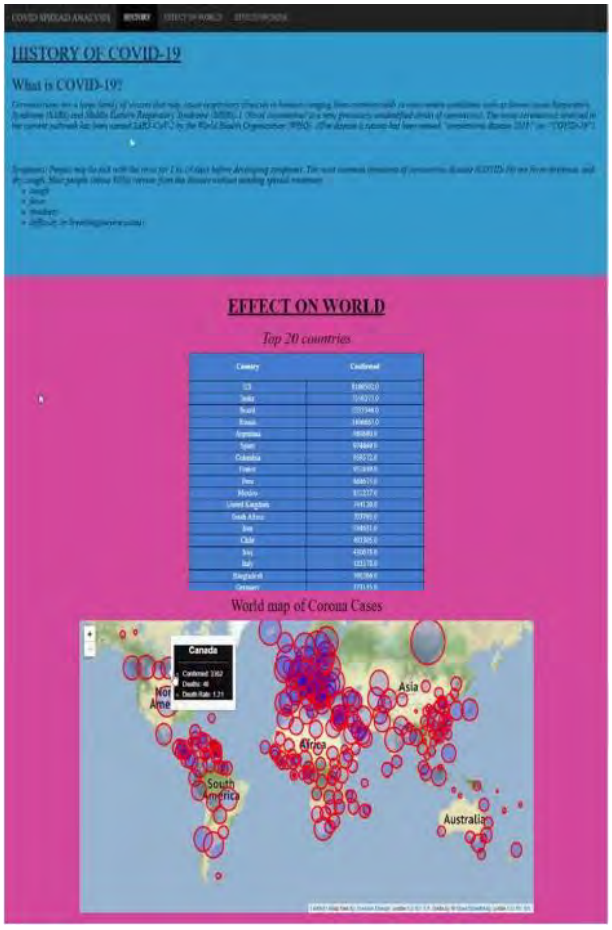


Fig.2. Output

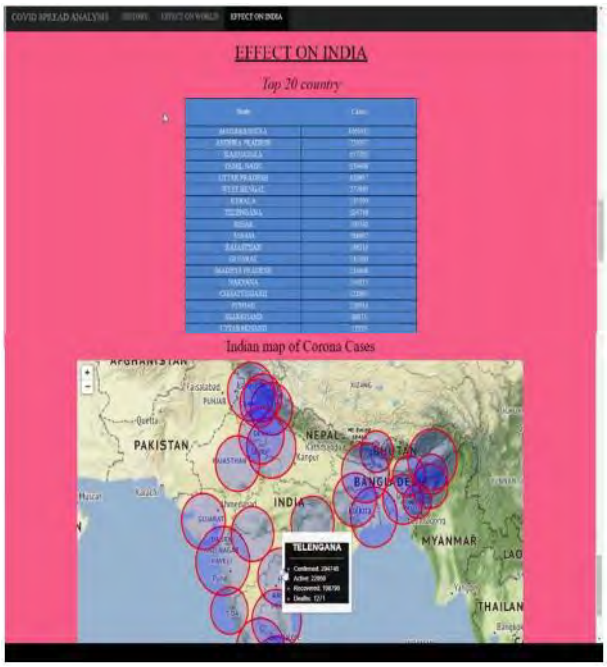


Fig.3. Output

IV. FUTURESCOPE

As a further part of this project, application of data prediction, which would predict the estimated rise in confirmed cases, recovered, active and death would be done. Additional to which hosting can be done, a site where the viewers can see the worst affected countries and states in India. A desktop notification feature can be added, which gets updates with live data by setting the frequency of time.

REFERENCES

[1] A. Mihoub, H. Snoun, M. Krichen, R. B. H. Salah and M. Kahia, "Predicting COVID-19 Spread Level using Socio-Economic Indicators and Machine Learning Techniques," 2020 First International Conference of Smart Systems and Emerging Technologies (SMARTTECH), Riyadh, 2020, pp. 128-133, doi: 10.1109/SMART-TECH49988.2020.00041.

[2] Chinazzi, M., Davis, J. T., Ajelli, M., Gioannini, C., Litvinova, M., Merler, S., ... & Vi-boud,C. (2020). The effect of travel restrictions on the spread of the 2019 novel corona-virus (COVID-19) outbreak. Science..

[3] M. R. Mufid, A. Basofi, S. Mawaddah, K. Khotimah and N. Fuad, "Risk Diagnosis and Mitigation System of COVID-19 Using Expert System and Web Scraping," 2020 International Electronics Symposium (IES), Surabaya, Indonesia, 2020, pp. 577-583, doi: 10.1109/IES50839.2020.9231619..

[4] A. A. Hussain, O. Bouachir, F. Al-Turjman and M. Aloqaily, "AI Techniques for COVID-19," in IEEE Access, vol. 8, pp. 128776-128795, 2020, doi: 10.1109/ACCESS.2020.3007939.

[5] Muladi et al., "Development of The Personnel Monitoring System Using Mobile Application and Real-Time Database During the COVID19 Pandemic," 2020 3rd International Seminar on Research of Information Technology and Intelligent Systems (ISRITI), Yogyakarta, Indonesia, 2020, pp. 371-376, doi: 10.1109/ISRITI51436.2020.9315377.

[6] Singh, R., & Adhikari, R. (2020). Age-structured impact of social distancing on the COVID-19 epidemic in India. arXiv preprint arXiv:2003.12055. Accessed from https://arxiv.org/pdf/2003.12055.pdf on 4th April 2020

[7] John Hopkins University (2020). Novel Coronavirus (COVID-19) Cases, provided by JHU CSSE. Accessed

from https://github.com/CSSEGISandData/COVID-19 on 6th April 2020

[8] John Hopkins-Coronavirus Research Center https://coronavirus.jhu.edu/map.html

[9] Ministry of Health and Family Wellfare https://www.mohfw.gov.in/

[10] GitHub Repository – BNSreenu - https://github.com/bnsreenu/python_for_microscopist s

[11] Kaggle Dataset for COVID-19 spread in India https://www.kaggle.com/sudalairajkumar/cov id19-inindia?select=covid_19_india.csv

This page is kept blank intentionally

Measuring Calories and Nutrition from Food Images

Atul Kumar Tiwari
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
1032180481@tcetmumbai.in

Punit Savlesha
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
1032180476@tcetmumbai.in

Yash Shetiya
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
1032180510@tcetmumbai.in

***Abstract*— The importance of calorie tracking is gaining wide acceptance in health and fitness sector. It becomes important to ensure that process is simple, fast, and effective. Estimation of right nutrient intake through food consumption has become increasingly significant to maintain the proper health of the wellbeing. The existing fitness applications require manual entry of food items to calculate calorie intake. The advancement in Machine Learning and Computer Vision has led to rise of TensorFlow API, OpenCV library and Keras for effective and accurate image processing using deep learning. In this paper, a fitness application that incorporates image processing to detect the food name and calculate the calories has been proposed. The main objective is to develop a fitness product that eliminates the manual entry of food items, thereby making the process of calorie counting an easy and fast.**

Keywords—Computer Vision, Convolutional Neural Network (CNN), Deep Learning, TensorFlow

I. INTRODUCTION

These days with easy access to internet, food is delivered at our doorsteps just on the click of a button due to which people have started to consume higher amount of fast food. This has accelerated the chances of suffering from a chronic disease known as obesity. Since obesity has become such a widespread disease, various mobile e-health applications have been developed for assistive calorie measurement to help people fight against health-related problems, hence increasing the demand of diet tracker applications. Estimation of right nutrient intake through food consumption has become increasingly significant in order to maintain the proper health of the wellbeing. The growing need of diet tracking in the world has evolved many applications that show you the calories intake a food product can provide, our project does it in a different manner, we will provide the option of taking the input as an image. The application will take the image of the food product as the input from the user and process it to show the output i.e. the calories it will be providing. For the making of such an application we will be using Python programming language, image processing, tensor flow and neural network. In this paper, we attempt to propose an image processing-based fitness application that will detect the food name and calories from user input image. We discuss about possible implementation and idea validation through a survey.

II. LITERATURE SURVEY

Ch. Kavya, R. Priyadarsini and B. Madhavi in their paper titled “Calories and Nutrition Measurement from the Image of Food” designed a system to extract features like colour, shape, size, and texture[1]. These were given to the K-nearest neighbor (KNN) for recognizing the food and then the calorie value was measured with the help of nutrition dataset. Hemalatha Reddy V., Kumari S., Muralidharan V., Gigoo K., Thakare B.S. talked about a similar system in their paper- “Food Recognition and Calorie Measurement Using Image Processing and Machine Learning Techniques”. They implemented with help of K-Means clustering [2]. I. Culjak, D. Abram, T. Pribanic, H. Dzapo and M. Cifrek’s paper "A brief introduction to OpenCV," discussed about OpenCV as an effective tool for image processing. OpenCV is an open source library for image and video analysis, originally introduced more than decade ago by Intel. It is important to note that OpenCV is considered by many to be side by side with many commercial image processing packages, and yet it is an open source tool[3].

The conventional approach of image classification has been pre-processing, feature extraction and classification by using classifiers like SVM, KNN, ANN, K-Means etc. These models have certain limitations as they are based on Machine Learning algorithms. The existing projects have managed to detect the food item and calories of naturally available food items such as fruits and vegetables, but these models fail in case of processed food. The concept of food detection is purely dependent upon features such as shape and color that are extracted from food image, in case of change in recipe the model may not give accurate results. There are numerous fitness applications that are available in market but none of them offer a mechanism of calorie tracking through food image. The existing work have tackled relatively small range of food items. In real life scenario, the variety of food available is huge hence trivial algorithms like SVM, K means clustering and KNN

cannot handle the large volume of dataset. This can lead to model failure or loss in accuracy of detection. Machine learning uses a set of algorithms to analyze and interpret data, learn from it, and based on the learnings, make best possible decisions.

On the other hand, Deep learning structures the algorithms into multiple layers to create an "artificial neural network. The most important difference between deep learning and traditional machine learning is its performance as the scale of data increases. When the data is small, deep learning algorithms do not perform that well. This is because deep learning algorithms need a large amount of data to understand it perfectly [4].

Hokuto Kagaya, Kiyoharu Aizawa, Makoto Ogawa implemented a CNN model in their paper " Image-based Calorie Content Estimation for Dietary Assessment,". They applied a convolutional neural network (CNN) to the tasks of detecting and recognizing food images. Because of the wide diversity of types of food, image recognition of food items is generally very difficult. However, deep learning has been shown recently to be a very powerful image recognition technique, and CNN is a state-of-the-art approach to deep learning[5].

Convolutional neural networks (CNN) are a special architecture of artificial neural networks. CNNs uses some of its features of visual cortex and have therefore achieved state of the art results in computer vision tasks [6]. Convolutional neural networks are comprised of two very simple elements, namely convolutional layers and pooling layers. Although simple, there are near-infinite ways to arrange these layers for a given computer vision problem. The elements of a convolutional neural network, such as convolutional and pooling layers, are relatively straightforward to understand [7].

A CNN works by extracting features from images. This eliminates the need for manual feature extraction. The features are not trained. They are learned while the network trains on a set of images. This makes deep learning models extremely accurate for computer vision tasks. CNNs learn feature detection through tens or hundreds of hidden layers. Each layer increases the complexity of the learned features.

III. PROPOSED METHODOLOGY

The Image processing model will be based on OpenCV and TensorFlow using python as scripting language. The model will make use of CNN to develop a neural network to detect food image and predict the food name. The dataset that will be used for developing the neural network is Food101, an open source food image dataset available on Kaggle repository. The dataset contains several different subsets of the full food-101 data. The idea is to make a more exciting simple training set for image analysis than CIFAR10 or MNIST. For this reason, the data includes massively downscaled versions of the images to enable quick tests.

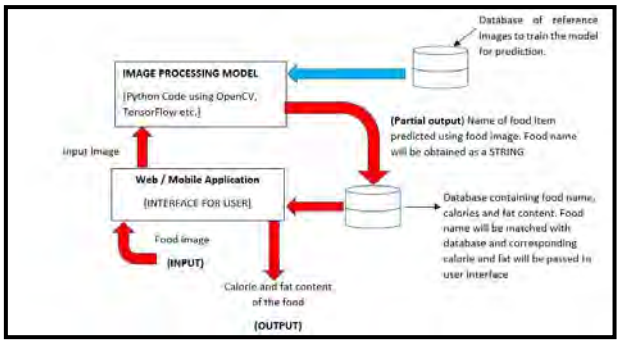


Fig.1. Block diagram of proposed implementation

The data has been reformatted as HDF5 and specifically Keras HDF5Matrix which allows them to be easily read in [8].

Classification of the food will be done by implementation of Convolutional Neutral Network; it will identify the food product as per the trained images. Convolutional neural network is composed of multiple building blocks, such as convolution layers, pooling layers, and fully connected layers, and is designed to automatically and adaptively learn spatial hierarchies of features through a backpropagation algorithm [9]. The CNN will start with an input image and then applies many different filters to it to create a feature map. It will apply a ReLU function to increase non-linearity and a pooling layer to each feature map and then flattens the pooled images into one long vector. The CNN will further input the vector into a fully connected artificial neural network. It will process the features through the network. It will train through forward propagation and backpropagation for many, many epochs [10]. These repeats until we have a well-defined neural network with trained weights and feature detectors. Analysis and output would be the last stage in this process, it will fetch the calories and nutrition content of the food product which gets identified by the classifier.

The project is mainly divided into two parts viz. (i) Calorie detection by image processing and (ii) a web or android interface for user to give the input image. The UI of the product will include several other features like BMI calculator and daily calorie intake tracker to fulfill the objective a comprehensive fitness application for healthy lifestyle.

IV. RESULT AND STATISTICS FROM THE SURVEY

A survey was conducted to know about people's opinion on the project and to check people's knowledge about calories and fitness. Another motivation behind conducting the survey was to get people's insight on what they want as a consumer. The average age of sample was found to be 26 years whereas 54.1% were Male and 45.9% were Female. Majority of the people were student by profession while others were from the working sectors.

Here are the questions which were included in the survey:

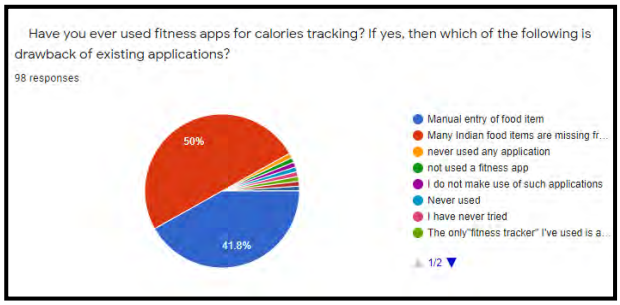


Fig.2.1 Survey result

According to the response we got from existing fitness application users we could generate an output for what drawbacks they think are present in current applications, the major share (50%) complain that many Indian food items are not recognized and about 42% feel that the manual entry of food items in application was a drawback.

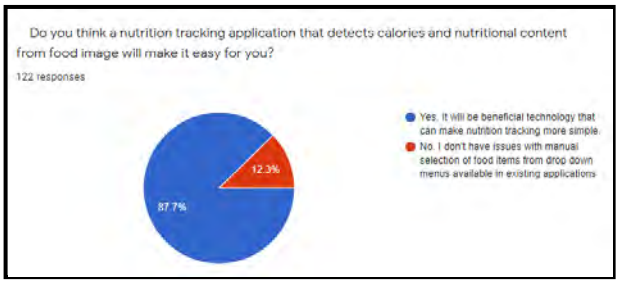


Fig.2.2 Survey result

When asked about the idea of nutrition tracking application that detects calories from food image the response that we got showed that about 87.7% of the responders were in favour of the idea and a small share of 12.3% were okay with the manual selection applications. A number of mobile fitness devices as well as smart watches have emerged on the technology landscape. However, the rate of adoption of these devices is still low especially in developing countries with a teeming population [11].

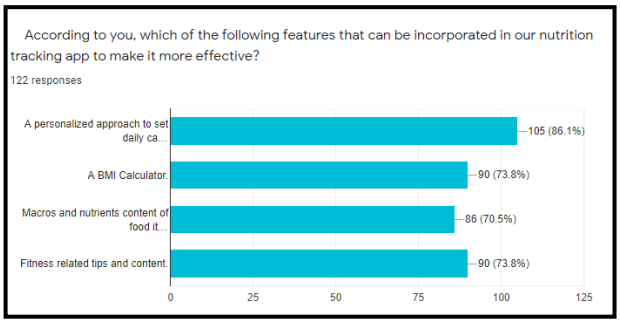


Fig.2.3 Survey result

In this question people were given the multiple choice of selecting what they think would make the app more effective. Almost 86.1% had opted for option 1 i.e. A personalized approach to set daily calories intake and synchronization with calories detected from food image, which was followed by option 2(A BMI Calculator) and option 4(Fitness related tips and content) selected 73.8% of people. Only 70% people had opted for option 3 i.e. Macros and nutrients content of food item.

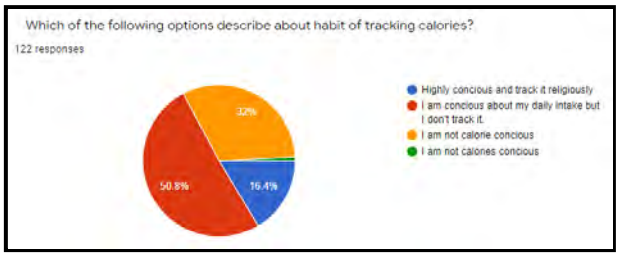


Fig.2.4 Survey result

From the question regarding to the pupil's habit of tracking calories we could say that a fair share of people about 51% are quite conscious about their daily calorie intake but they do not keep a track of it, the next highest share of 32% belonged to the ones who are not calorie conscious and about 16% of the entries showed that they were highly conscious about their intake and track it.

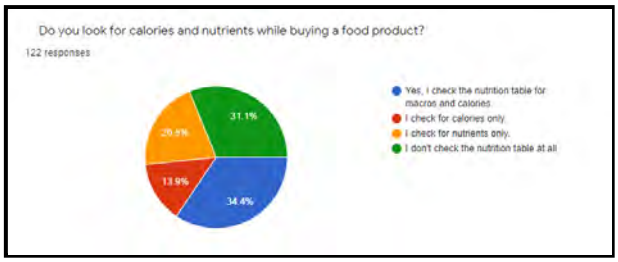


Fig.2.5 Survey result

Large share of the responses were covered by the ones who do check the calorie table(34%) and the one's don't check the nutrition table at all(31%), about 35% recorded the answer that they do check either the calories or the nutrients.

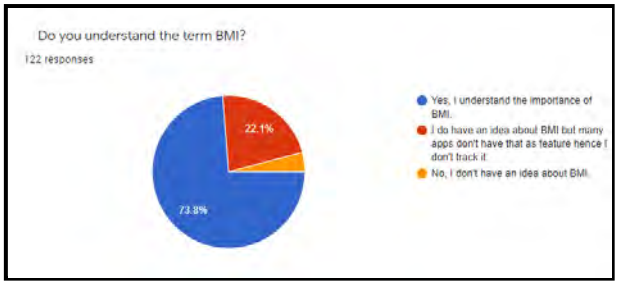


Fig.2.6 Survey result

From our survey it could be said that majority of the people knew about BMI(Body Mass Index) and its importance, while few only had an idea of it but don't value it and are not keen to track it. The body mass index (BMI) is the metric currently in use for defining anthropometric height/weight characteristics in adults and for classifying (categorizing) them into groups. The common interpretation is that it represents an index of an individual's fatness. It also is widely used as a risk factor for the development of or the prevalence of several health issues [12].

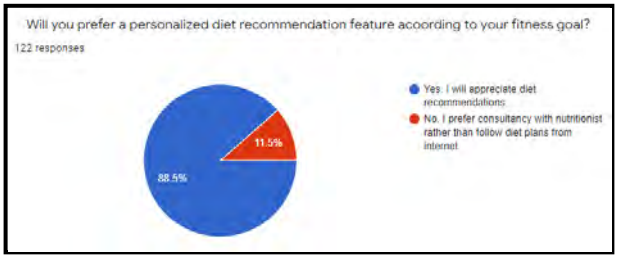


Fig.2.7 Survey result

According to the response we got when asked for the want of a personalized diet recommendation feature, majority share of 89% were in favor of it whereas the rest preferred professional nutrition consultants and plans from online sites.

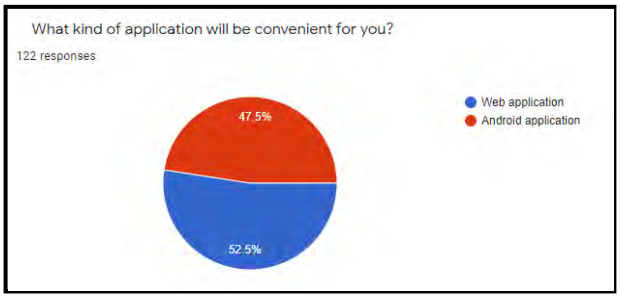


Fig.2.8 Survey result

With the growing technology it is important to know which base do the people want, from the survey we could conclude that people favor web applications by quite a narrow margin to android application.
We had also asked people's opinion on what they would like to incorporate in our project to make it user friendly and appealing to the users. Some of the top suggestions given by the people were: (i) The project should be flexible in taking the quantity in terms of grams as well as in ml. (ii)) More Indian food items should be available in the database and (iii) To add the feature of keeping a track on user's daily water intake.

V. CONCLUSION

The importance of tracking daily calorie intake is increasingly gaining importance. It becomes highly important to ensure that calories calculation is effective rather than tedious task. The manual entry of food item and quantity is biggest challenge that user face with existing applications. Hence, it is important to integrate image processing feature that can detect the food item, estimate the weight of serving and compute the calories. This project focuses on developing and integrating an image processing system to detect calories from food image using CNN algorithm and deep learning to the existing fitness applications.
The proposed model is currently based on restricted size of data set from perspective of hardware, software, and memory requirement but it can be made scalable by using cloud driven technologies and frameworks like MERN/MEAN to achieve the goal of efficient calorie tracker with wider range of available food items for predictions. In future, the concept of UI/UX design must be incorporated to develop an actual product that can be proposed for public.

VI. ACKNOWLEDGEMENT

We are very thankful to our guide Ms. Purnima Chandrasekar, Assistant Professor in Department of Electronics & Communication Engineering in Thakur College of Engineering and Technology for the guidance, support and encouragement in every aspect towards the project.

REFERENCES

[1] Ch. Kavya, R. Priyadarsini and B. Madhavi, "Calories and Nutrition Measurement from the Image of Food" International Journal of Advance Research, Ideas and Innovations in Technology, https://www.ijariit.com/manuscripts/v3i3/V3I3-1205.pdf

[2] Hemalatha Reddy V., Kumari S., Muralidharan V., Gigoo K., Thakare B.S. (2020) Literature Survey—Food Recognition and Calorie Measurement Using Image Processing and Machine Learning Techniques. In: Kumar A., Mozar S. (eds) ICCCE 2019. Lecture Notes in Electrical Engineering, vol 570. Springer, Singapore.

[3] I. Culjak, D. Abram, T. Pribanic, H. Dzapo and M. Cifrek, "A brief introduction to OpenCV," 2012 Proceedings of the 35th International Convention MIPRO, Opatija, 2012, pp. 1725-1730.

[4] P. Pouladzadeh, S. Shirmohammadi and R. Al-Maghrabi, "Measuring Calorie and Nutrition From Food Image," in IEEE Transactions on Instrumentation and Measurement, vol. 63, no. 8, pp. 1947-1956, Aug. 2014, doi: 10.1109/TIM.2014.2303533.

[5] Hokuto Kagaya, Kiyoharu Aizawa, Makoto Ogawa ," Image-based Calorie Content Estimation for Dietary Assessment," "MM '14: Proceedings of the 22nd ACM international conference on Multimedia November 2014," 2018 25th IEEE International Conference on Image Processing (ICIP), Athens, 2018, pp. 171-175, doi: 10.1109/ICIP.2018.8451422.

[6] W. Zhang, D. Zhao, W. Gong, Z. Li, Q. Lu and S. Yang, "Food Image Recognition with Convolutional Neural Networks," 2015 IEEE 12th Intl Conf on Ubiquitous Intelligence and Computing and 2015 In this paper, the authors present a food image recognition method with CNN and achieve an accuracy of 80.8% for the fruit image dataset we establish ourselves and 60.9% for the UEC-FOOD100. By analysing IEEE 12th Intl Conf on Autonomic and Trusted Computing and 2015 IEEE 15th Intl Conf on Scalable Computing and Communications and Its Associated Workshops (UIC-ATC-ScalCom), Beijing, 2015, pp. 690-693, doi: 10.1109/UIC-ATCScalCom-CBDCom-IoP.2015.139

[7] J Ms. Ankita A. Podutwar , Prof. Pragati D. Pawar , Prof. Abhijeet V. Shinde," A Food Recognition System for Calorie Measurement", International Journal of Advanced Research in Computer and Communication Engineering ISO 3297:2007 Certified Vol. 6, Issue 1, January 2017, ISSN (Online) 2278-1021 ISSN (Print) 2319 5940

[8] K Scott Mader, "Food Images (Food 101)', Available: https://www.www.kaggle.com/kmader/food41.

[9] Yamashita, R., Nishio, M., Do, R.K.G. et al. Convolutional neural networks: an overview and application in radiology. Insights Imaging 9, 611–629 (2018). https://doi.org/10.1007/s13244-018-0639-9 .

[10] S. Albawi, T. A. Mohammed and S. Al-Zawi, "Understanding of a convolutional neural network," 2017

International Conference on Engineering and Technology (ICET), Antalya, 2017, pp. 1-6, doi: 10.1109/ICEngTechnol.2017.8308186

[11] Adewumi, Adewole & Olatunde, Godwin & Misra, Sanjay & Maskeliunas, Rytis & Damasevicius, Robertas. (2018). Developing a Calorie Counter Fitness App for Smartphones. 10.1007/978-3-319-74980-8_3.

[12] Nuttall, Frank Q. MD, PhD Body Mass Index, Nutrition Today: May/June 2015 - Volume 50 - Issue 3 - p 117-128 doi: 10.1097/NT.000000000000009.

This page is kept blank intentionally

Brain Tumor Detection Using Image Segmentation

Amogh Johari
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
amogh.johari@gmail.com

Nikhil Pandey
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
pandeynikhil176@gmail.com

Rahul Pandey
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
rahulpandey42081@gmail.com

***Abstract*— Image segmentation is a process of partitioning a digital image into N regions. In today's world, Brain tumor detection using image segmentation is fundamental and challenging problem in field of image processing due to the diverse image content, image noise, non-uniform object texture and other factors. Accurate detection of size and location of brain tumor plays a vital role in the diagnosis of brain tumor. Segmentation of images is used to subdivide an image to its regions for components or objects and it is an important tool used for medical image processing. The deeper architecture design is performed by using small kernels. The weight of the neuron is given as small. Other methods such as K-means, SVM Methods will be used for brain tumor detection. The accuracy of all these methods will be compared with each other. Large number of layers and datasets will be used to train the model and for increasing the accuracy. Experimental results show that the CNN archives rate of about 97.5% accuracy.**

Keywords—Brain tumor, MRI, Image Segmentation, Convolutional Neural Networks (CNN)

I. INTRODUCTION

Brain Tumor segmentation is one of the most crucial and arduous tasks in the field of medical image processing as a human- assisted manual classification can result in inaccurate prediction and diagnosis. Brain tumors have high diversity in appearance and there is a similarity between tumor and normal tissues and thus the extraction of tumor regions from images becomes unyielding. In order to overcome the difficulties in evaluating the brain tumor through MRI Images, an automated detection method for brain tumor using convolutional neural network (CNN) is proposed in this project. Brain tumor detection using image segmentation can be used by radiologists and in hospitals to get more accurate results as the MRI Images are not always clear. Experimental results show that the CNN archives rate of 97.5% accuracy with low complexity and compared with the all other state of arts methods.

II. LITERATURE SURVEY

Mr. Digvijay Reddy et al designed a methodology in which a two-step procedure for brain tumor detection that combines k- means clustering algorithm followed by level set segmentation and morphological operations. Various features such as contrast, correlation etc. can be added to make the system is more sensitive to the texture and various other factors. [1].

Ms. Siddhi N. Nerurkar had shown that the two most efficient algorithms which are the k-means and region growing methods in her research work. The k-means algorithm is used which is proved to be less accurate than region growing method. These methods can also be further used for MRI images of spinal cord.[2]

J. Seetha and S. Selvakumar Raja used CNN method for brain tumor detection. In this paper, the raw pixel value with depth, width and height feature value are extracted from CNN. The Gradient decent based loss function is applied to achieve high accuracy. In this paper, CNN algorithm used is the most accurate method for image segmentation. The validation accuracy of CNN method is high and validation loss is very low. [3]

Gamage P.T. used Median filter and Gaussian filter for brain tumor detection. In this paper, the processes of pre-processing, image segmentation, feature extraction and image classification are used for identifying brain tumor. Median filter and Gaussian filters are used one of the best methods to remove noise from the images. The thresholding is the best and easiest approach among image segmentation techniques. When the contrast between foreground object and background object is comparatively high, threshold technique works well.[4]

T. Logeswari and M. Karnann used the HSOM algorithm for brain tumor detection. The HSOM algorithm used provides the information that how many numbers of tumor cells are affected. The time for detecting the tumor cells are also provided using HSOM. The performance of the MR image in terms of execution time and the number of affected cells is detected. The system should be improved by adapting more segmentation algorithm to suit the different medical image segmentation. [5]

III. METHODOLOGY

The CNN based brain tumor classification is divided into two phases such as training and testing phases. The training accuracy, validation accuracy and validation loss are calculated efficiency of various brain tumor classification scheme. In convolution neural network, image can scalable that is, it will take 3D input volume to 3D output volume (length, width, height).The Convolution Neural Network (CNN) consists of input layer, convolution layer, Rectified Linear Unit (ReLU) layer, pooling layer and fully connected layer.

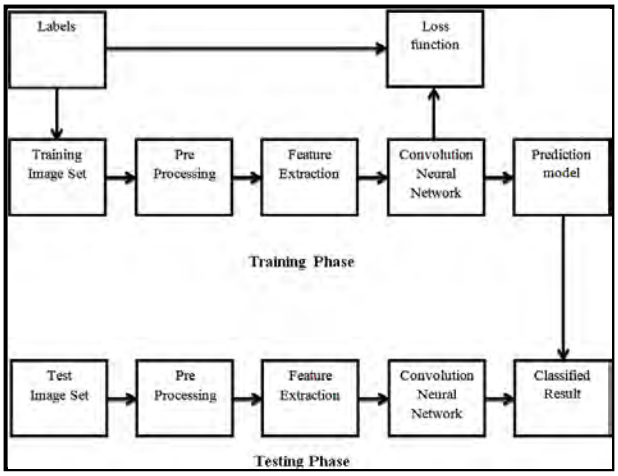


Fig.1. Diagram of brain tumor classification using CNN

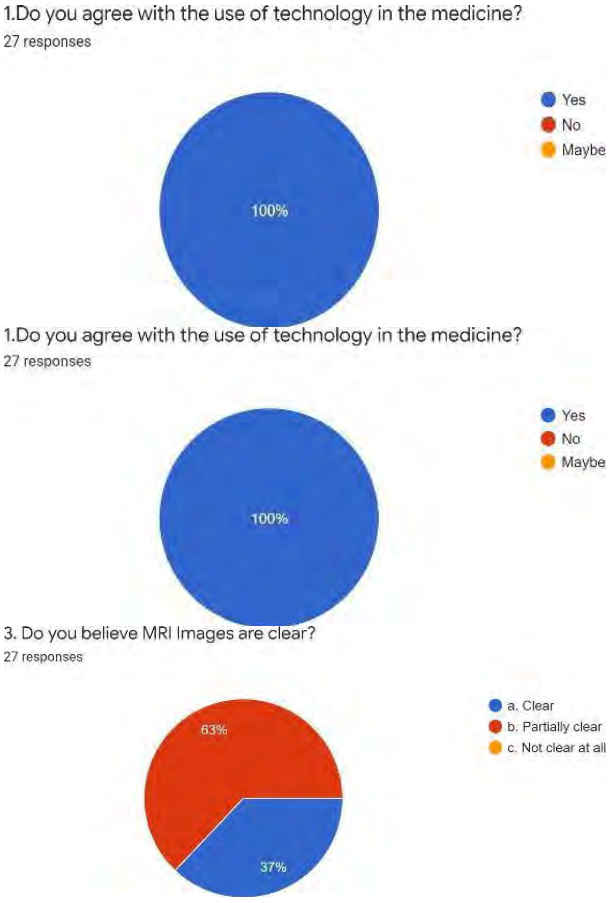
The K-means based segmentation is also performed for brain tumor detection. With comparison to CNN method, computation time is high and accuracy is low in K- means method based tumor and non-tumor detection. In the training phase, preprocessing, feature exaction and classification with Loss function is performed to make a prediction model. If it is required to train from the starting layer, we have to train the entire layer, which is up to ending layer. Hence, time consumption is very high and this will affect the performance. To avoid this kind of problems, pre-trained model of brain dataset is used for classification steps. The quality of particular
set of parameters is measured by loss function which can be calculated by using gradient descent algorithm. The accuracy of the system depends upon the loss function. When the loss function is low, the accuracy is high.

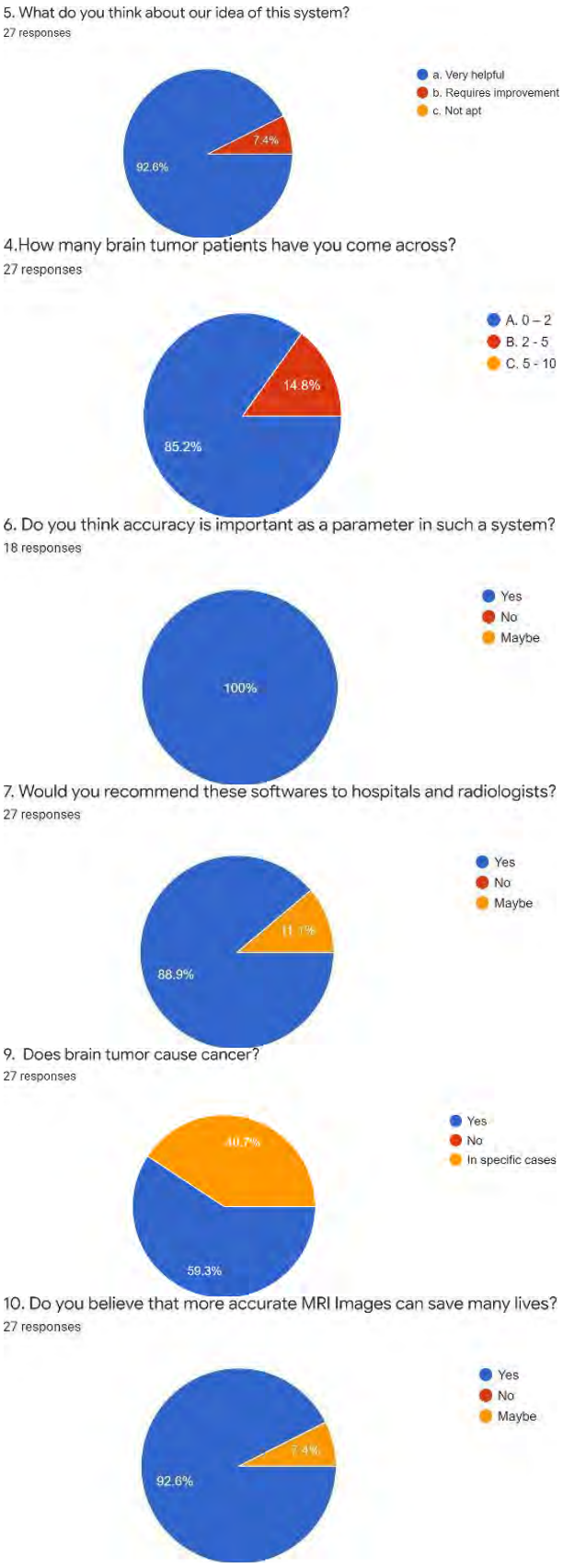
IV. EXPECTED RESULT

A survey was conducted to know about people's opinion on the project and to check people's knowledge
A comparison was carried out between the proposed methodologies which are classification using traditional machine learning classifiers and CNN. The feature value is taken from CNN itself. It is shown that the classified result of Tumor and Non-tumor brain image. Hence the complexity and computation time is low and accuracy is high. The classification results as Tumor brain or non-tumor brain based on the probability score value. Usually, most of the segmentation algorithms have implemented using MATLAB, but in CNN method, an attempt is made to implement the same in Python language as the lines of code will get reduced. Researchers got 83.0% accuracy using SVM based classification and 97.5% accuracy using CNN. For better results, CNN was implemented which brought in the accuracy 97.87% with a split ratio of 80:20 of 217 images, i.e. 80% of training images and 20% of testing images.

V. SURVEY

The following survey was conducted for our project on around 25 people which included students of engineering colleges as well as industry professionals. The survey included questions related to the project and many observations were drawn from this survey. Majority of the people still believe that MRI Images are partially clear. All the people had agreed with the use of technology in medicine. Most of the people found our idea of this project very useful and would recommend these software to hospitals and radiologists. All the people believe that accuracy is an important parameter in this system. Most of the people believe that more accurate MRI Images can save more lives of patients. All the people believe that in specific cases, brain tumor can lead to cancer.





VI. CONCLUSION

The main goal of this research work is to design efficient automatic brain tumor classification with high accuracy, performance and low complexity. The brain tumor detection using image segmentation will be done with one of the most accurate methodologies, in order to detect brain tumor with high accuracy. The most accurate segmentation method is the Convolutional Neural Network Algorithm method which is 97.5%, region growing method which is 92.5%, followed by threshold segmentation which is 91%. CNN is one of the deep learning methods, which contains sequence of feed forward layers. Python language is used for implementation. It was seen that though K-means method is easy and efficient, it is not as accurate as the CNN method. Image segmentation plays a significant role in medical image processing as medical images have different diversities. The project can be further implemented on MRI Images of various other organs such as spinal cord, lung, liver etc. The GUI can be more enhanced and it can be used by hospitals which will help detecting Brain tumor at the exact place, thereby helping lives of the patients.

REFERENCES

[1] D.Reddy, Dheeraj, Kiran, V. Bhavana and H. K. Krishnappa, "Brain Tumor Detection Using Image Segmentation Techniques," 2018 International Conference on Communication and Signal Processing (ICCSP), Chennai, 2018.

[2] Seetha J, Raja S. S. Brain Tumor Classification Using Convolutional Neural Networks. Biomed Pharmacol J 2018;11(3).

[3] Tonmoy Hossain , Fairuz Shadmani Shishir , Mohsena Ashraf, MD Abdullah Al Nasim, Faisal Muhammad Shah," Brain Tumor Detection Using Convolutional Neural Network," 1st International Conference on Advances in Science, Engineering and Robotics Technology, 2019.

[4] Siddhi N. Nerurkar ," Brain Tumor Detection using Image Segmentation", International Journal of Engineering Research in Computer Science and Engineering (IJERCSE) , April 2017.

[5] T. Logeswari and M. Karnan " An improved implementation of brain tumor detection using segmentation based on soft computing", Journal of Cancer Research and Experimental Oncology Vol. 2(1), March, 2010.

[6] Gamage P.T. Faculty of Information Technology, University of Moratuwa "Identification of Brain Tumor using Image Processing Techniques", 11 September 2017

This page is kept blank intentionally

Covid-19 Hospital Data Management

Avyay Rao
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
avyayrao4@gmail.com

Aman Rawat
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
amanrawat11.ar@gmail.com

Shantanu Varshney
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
shantanuvarshney10@gmail.com

Prof. Deepak S. Shete (Guide)
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
deepak.shete@thakureducation.org

***Abstract* — The project 'Covid-19 Management System' is predicated on the information, object bound and networking techniques. As there are several area units wherever we have a tendency to keep the records in information that that we have a tendency to victimize MY SQL code which is one in every of the simplest and also the best code to stay our info. This project uses JAVA because the front-end code that is associate degree Object bound Programming and has property with MY SQL. The Covid-19 Management System is custom engineered to satisfy the precise demand of the middle and enormous size hospitals across the world. All the desired modules and options are significantly engineered to simply slot into your demand. This package has been widely accepted by purchasers in Republic of India and overseas. Not stopping solely to the present however they're extremely happy and appreciating. Entire application is net based mostly and engineered on three tier design victimization the newest technologies. The sound information of the application makes it additional users friendly and expandable. The package is very customizable and may be changed as per the requirements of our purchasers. Prolonged study of the functionalities of the hospital and its specific demand has given it an exquisite form each technically and usefulness wise. It covers all the desired modules right from Patient Registration, medication details, Doctor, Wards, Admin, Store, Patient appointment, bill payment, record modification, discharge details etc.**

Keywords— Database, MySQL, JavaScript, Webpage.

I. INTRODUCTION

We all know that due to these COVID-19 situation there have been issues regarding fast and easy hospital management, ranging from Managing healthcare quality improvement and compliance documentation, workflow, and analytics, Healthcare workflow and task management solution with pre-arrival and patient status management functionality. Being that these professions are in the increase day-by-day and there are lots of jobs done just to improve the services rendered to patients that visit the hospital, there is need for Application that addresses the administrative needs of health care practices, ambulatory surgery centres. Computers have improved the accuracy, speed and reliability of many of the administrative and technical tasks traditionally involved in patient care besides improving the service offered to patients. This presentation proposes a Web based framework for health care industries that orchestrates all activities performed in hospitals.

II. PROBLEM DEFINITION

The existing systems provide the basic functionalities needed to be handled in a hospital management environment. There is no intelligence of the software in such cases. In the existing system all the patient details, doctor availability details and regarding the tests done to the patients prescribed by the doctor is maintained manually by the receptionist. If a patient has to be admitted we need to check the availability of the bed which consumes lots of time if done manually. Also there is no proper search technique to check the patient information. It is a very difficult task to maintain all the finance management systems, and the records which maintain doctor details, of the hospital by using this existing system. There are also many loopholes when we look at the security of the system. These are the main disadvantages of the existing systems that are overcome in the proposed model.

III. MOTIVATION

We all know that due to this rising COVID-19 situation there has been a lot of chaos. This chaos is mainly experienced in the medical line and hospital regions. The number of COVID-19 cases were increasing day by day creating a huge disorder in the hospitals to manage them. That is why we have created a different database system that only allows us to manage the COVID-19 patients in a much mannerly, calm and ordered way.

IV. LITERATURE SURVEY

Xiaofei Zhang mentioned in his paper - 'Design of hospital beds center management information system based on HIS', how There is a fair amount of literature on the recommended methodologies for Open Source Projects but as pointed out, these methodologies are applicable to projects where a diverse community of developers, typically dispersed geographically, participate in the process.
The aim of the paper presented by Yoshimune Shiratori

– 'Designing A Web Based Hospital Management System For MOUAU Clinic' was to propose an efficient web-based real-time system for the betterment of medical research and analysis, which would bring about ease of accessing medical records and the ease of getting treatment. Today some problems persist in the hospital such as loss patients medical records and other important files, this paper was going to tackle these problems. This system would help to replace the manual method, then speeding up the processing, storing and retrieval of information, which would greatly assist the medical personnel in performing their duties.

Igbajar Abraham in his paper – 'Management System of Paper-Based Critical Pathways Developed in Each Hospital: Comparison between Medical School Hospital and General Hospital' viewed a management system of paper-based critical pathways which had developed in a general hospital and modified it and introduced it to a medical school hospital, and the differences of specifications were discussed.

Digvijay H. Gadhari, in his paper – ' Hospital Management system' aims to computerize the Front Office Management of Hospital to develop software which is user friendly, simple, fast, and cost – effective. It deals with the collection of patient's information, diagnosis details, etc. The main function of the system is to register and store patient details and doctor details and retrieve these details as and when required, and also to manipulate these details meaningfully. System input contains patient details, diagnosis details, while system output is to get these details on to the screen.

V. PROPOSED DESIGN

The Covid-19 Management System is meant for any hospital to switch their existing manual paper based mostly system. The new system is to manage the data of patients. Area availableness, staff and surgery schedules and patient invoices. These services are unit to be provided in an associate degree efficient, value effective manner, with the goal of reducing the time and resources presently required for such tasks.

We have used Iterative and Incremental Development model (IID) for our project development. This development approach is also referred to as Iterative Waterfall Development approach. Iterative and Incremental Development is a software development process developed in response to the more traditional waterfall model. This model is designed to take care of such big project. The large and complicate project chiefly demand better development and testing procedure. The waterfall model is well known for its repeated testing process. Hence I choose the waterfall model for developing the software.

Hospital Systems could be a customizable, comprehensive, and integrated Covid-19 Management System designed to manage all hospital operations. Ancient approaches cover paper-based informatics moreover as resident work position and mobile information acquisition and presentation.
The customizable alert package sends the text, IM, and email reminders and improves the standard of patient care. This Covid-19 management package helps you to remember revenue streams, patient records, and alternative essential metrics in period at your fingertips. Organizing doctor schedules, collating patient notes, and handling payment is easy. Doctors and Patients will check the calendar on mobile phones and live less chaotic lives. The Covid-19 Management System package is accessible for on premise and on-cloud installations. We have a tendency to develop Hospital Systems - Covid-19 Management data systems supported the simplest practices around the world.

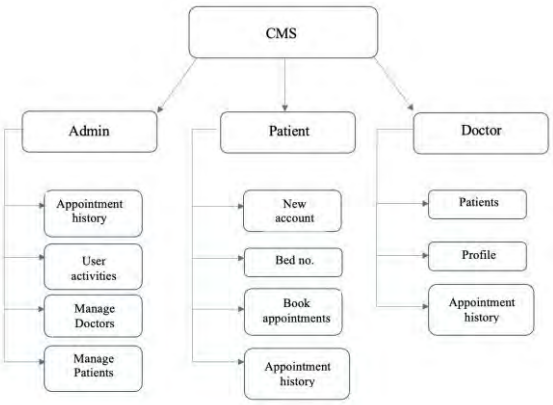


Figure 1. Data flow diagram

VI. RESULT & DISCUSSIONS

We have to date the importance of CMS, it's our responsibility to choose the proper reasonable CMS for your desires and functions. Here we tend to provide a lot of data on the advantages of varied CMS and also the impact it creates on hospital systems.

1. Easy Patient information retrieval: CMS makes it doable to access all the information associated with a patient via a system by suggesting that of many straightforward clicks. Data like patient history, current malady, doctors concerned, tests reports taken, request data and lots of a lot of are often created visible to the user. These information can facilitate the dots concerning the patient, like specific identification, connected treatment, and drugs.

2. Increased information security: The patient information is often unbroken by exploiting CMS in your hospital. It is often created accessible by solely a restricted quantity of approved personnel. With CMS, all the information is kept on a server or cloud by simply securing the login information safely.

3. Improved Visibility and Transparency: Covid-19 Management System (CMS) improves the visibility and transparency within the complete management method and all told records.

4. Streamline accurate Reporting: It helps in streamlining the correct news with the assistance of updated and correct records.

5. Improved Quality Control: The Covid-19 Management System improves the standard management of the merchandise and services of the hospital.

7. Ease to Access System Facilities: Covid-19 Management System makes it simple to urge access to the management system facilities for the approved users and keep it safe from unauthorized users.

8. Cost Effective: CMS not solely saves time within the hospital however is also efficient in decreasing the amount of individuals functioning on the system of manual entry of knowledge and work. The implementation of His can decrease the human intervention into the system thereby avoiding human-caused errors.

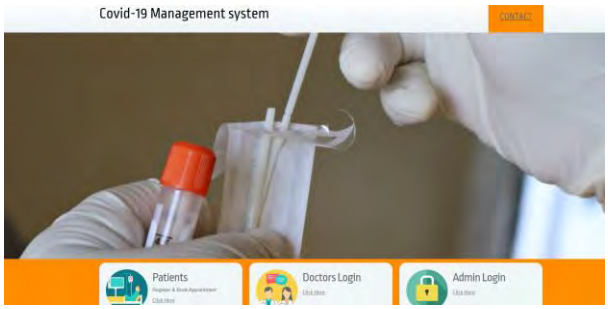


Figure 2. Home Page

This is the home page of the project created, this is where the patients, doctors and admins can access their profiles by logging in.

Figure 3. Login Page

This is how all three login pages (Doctor, Admin and Patient) will look on the website once we access either of the three through the homepage.

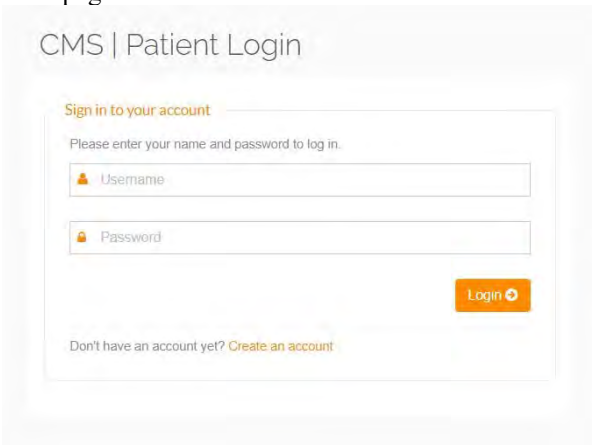


Figure 3. Login Page

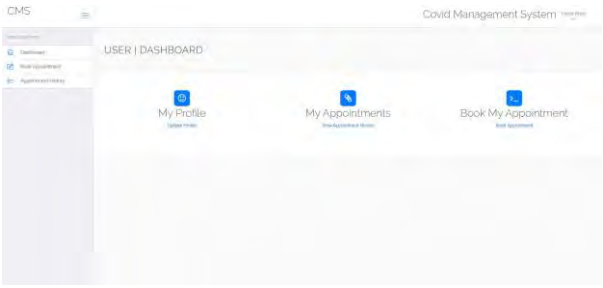


Figure 4. User Dashboard

Above is the page which will be reflected after logging in; the user will be able to access particular facilities which differ according to their need. For example, the admin can view the patients and manage them as well.

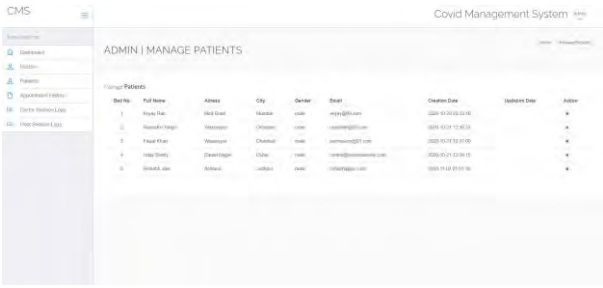


Figure 5. Admin: Manage Patients

Above we can observe the section where the admin can go through the list of patients that have created a profile in the 'Patient' section. Here, the Admin can also remove the respective patients if there is a need for the same.

VII.SCOPE OF PROJECT

Covid-19 management systems allow us the ability to optimize and digitize all the processes within the institution, which will help to improve customer service, reduce process costs, streamline the search of medical records, bills, patients, doctors, etc.; thus, having a database of each module implemented.

A Covid-19 management system is a web system developed for companies that wish to manage their processes, implementing modules for each of the required areas. It is essential to mention that the information is controlled by trained personnel. Computer technology is only a tool that allows us to perfect the inveterate use of paper records (notebooks, index cards, diaries, bibliographies, record books), or more recently, cassettes or video cassettes. A PC only collects and processes data; it is the individual that acquires information.

VIII. CONCLUSION

Taking under consideration all the mentioned details, we are able to build the conclusion that the Covid-19 management system is that the inevitable a part of the lifecycle of the trendy consultation room. It automates varied daily operations and allows sleek interactions of the users. Developing the hospital system software system could be a nice chance to form the distinct, economical and quick delivering tending model. Implementation of Covid-19 management systems helps to store all sorts of records, offer coordination and user communication, implement policies, improve regular operations, prepare the provision chain, and manage money and human resources, and market hospital services. This useful call covers the requirements of the patients, employees and hospital authorities and simplifies their interactions. It's become the same old approach to manage the hospital. Several clinics have already older its blessings and continue developing new Covid-19 management system project modules.

REFERENCES

[I] INSPEC Accession Number – 17433364, Authors: Lu ren, Xiaofei Zhang, Jingxia Wang, Siyuan Tang, Ni Gong.

[II] INSPEC Accession Number – 9720396, Authors: Shunji Wakamiya, Kazunobu Yamauchi, Junichi Kiryu, Yuichiro Ogura, Yoshimune Shiratori.

[III] ISSN - 2394-9333, Authors: Ilo S.F, Igbajar Abraham, Acholonu Joyce .C

[IV] ISSN - 2494-9150, Authors: Digvijay H. Gadhari, Yadnyesh P. Kadam, Prof. Parineeta Suman.

Live Attendance System using Image Processing

Pragun Tiwari
Department of Electronics & Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
1032180507@tcetmumbai.in

Gaurav Yadav Department of Electronics & Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
1032180474@tcetmumbai.in

Jaihind Yadav Department of Electronics & Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
1032180514@tcetmumbai.in.com

Prof. Deepak S. Shete (Guide)
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
deepak.shete@thakureducation.org

***Abstract* — Live attendance system using image processing refers to an algorithm that is capable of detecting an image of a student/employee and acknowledging his/her presence in the attendance sheet after comparing the image with its database and successfully matching the features of both the images. This project is based on image processing using open-cv. The basic architecture and all the algorithms used in the model are described in the paper elaborately. Moreover in order to evaluate and enhance the performance of the system many if the filter functions are used which provide the capability to capture and recognize the images even in dull and low light places. The live attendance system is much more efficient than the traditional attendance systems both in saving time and maintaining the database.**

Keywords— live attendance, database, Open-CV, face recognition.

I. INTRODUCTION

The pandemic situation around the globe has forced the educational institutes to conduct all the lectures online for safety purposes. While conducting online lectures, the task of marking attendance can be avoided by using this algorithm and human labour can be reduced. Nowadays, the research is growing towards the invention of new approaches. One such most attracted application is face recognition of image processing. The method proposed is to record the attendance using face recognition and face detection.

This project requires the creation of a dataset with the images of the student whose attendance are to be marked. The dataset must contain multiple images of every student in different camera angles and different lighting conditions. Many softwares like Jupyter lab, Jupyter notebook, MATLAB can be used for this project. There are certain idle also available for the implementation of this project like PyCharm for the members using the python language and eclipse idle for the members using Java.

There are also many algorithms available for this project. For instance the cascade classifier for detecting the faces, the local binary histogram pattern(LBHP) for face recoginition. The personal component analysis(PCA) algorithm, Viola James Algorithm and so on.For maintaining the dataset for this project, datasets imported in the projects are mainly used. But for people who tend to give this project a website, they create a database.Also this project is available to be performed on Visual studio code. The attendance is generated in the excel sheet for the time which would be provided through the programing. All the images would be stored in the same directory as th .py files.

II. LITERATURE SURVEY

Himanshu Tiwari in his paper title 'Live attendance system Via face recognition' commented that the feasibility of the model can be increased drastically if we hire a cloud space in order to stroe the data of the students. In this way this model can even be used for the entire college in the respective departments.

The local binary pattern histogram (LBPH) and MySql were used in this project by the author C.B Yuvraj, M Srikanth, V. Santosh Kumar in their paper titled – 'An approach to maintain attendance using image. processing' emphasized on advantages of Haarcascade. They built a project to maintain attendance in a live class and not an online class. They mentioned in the report that the threshold value of range 1.1 to 1.3 is recommended while detecting the face. They used haar cascades based on Viola jones and Open-CV libraries.

In 'Face recognition Based attendance system' by Neha Kumari Dubey and Dhanush Gowda they proposed a method which will have higher accuracy in recognition of multiple faces in a single frame with lower response time. This system marks the attendance using live video stream generated by webcam. The frames are extracted from the video using open-cv. The ma implementation steps used in this type of system are face detection and recognizing the detected faces for which dlib is used Deb Barma and Nirmala Kar in their paper titled 'Study of implementing automated attendance system using face recognition technique' revealed the importance of a database in development of any project. Paul-Viola face extracting framework was used for extraction part. Personal Component Analysis (PCA) algorithm was used for face recognition. It was observed that with increasing angle of face

with respect to the camera, there is decrease in detection and recognition rate and increase in response time.

In the paper titled 'Automated attendance system using image processing', the authors have used the Viola james framework. In that project, they have specified that the training maybe slow but the detection and recognition of the faces fast.

The authors Akshara Jadhav and Tushar Ladhe, in their paper titled, 'Automated attendance system using face recognition', have firstly extracted the image of the faces by converting them into greyscale and the applying histogram equalization. Then they have applied the PCA algorithm for classification of the faces.

Some papers like the one titled, 'Face recognition automatic class attendance system', by the authors Rabab Alayham and Sani Salsabil have made use of the Netbeans IDE for the construction of their dataset and the whole process is done on a frontend homepage.

III. PROPOSED METHODOLOGY

The Image processing model will be based on OpenCV using python as scripting language. The model will make use of cascade classifier and haar cascade files to create the dataset of the images of the students. The .xml files like haarcascade frontal face .xml were used in this algorithm. Once the faces are captured and detected through the image they are stored in the dataset. Several images of a single student is captured so to give a better accuracy percentage.

The algorithm used for recognition of the images is the local binary histogram pattern(LBHP) algorithm. LBP is a simple and efficient texture operator which labels the pixels of an image by thresholding the neighborhood of each pixel and considers the result as binary number. LBHP has 4 parameters namely radius, neighbor, grid x, grid y. The radius parameter is usually set to 1. It is used to build a circular binary pattern around the central pixel. Neighbor is the number of samples to build the circular binary pattern.

After the detection and recognition of the images and storing them into the dataset, now the algorithm is trained to generate the attendance. For this purpose, both the algorithms that is the LBHP for recognition and cascade classifiers for detection are used. The Python imaging library (PIL) is also used for this purpose.

After the dataset is successfully trained that is after all the images are detected and recognized, the next step will be to mark the attendance. For this purpose, we have to import the xlwrite module in our program. This module is used to write certain data about a particular id from the given program. If certain condition that are in loop format are satisfied in the program, then with the used of functions imported from this module, the excel sheet is updated.The whole process is carried out by givingeach and every student a certain id which is then used in the program to compare the images stored with the particular id and then the whole recognition and xl sheet updating process is carried out. The figure 1 below shows the overflow of the project. The dataset construction if generally done on the system in some directory by storing the images into them, but in some cases it is also done by the use of real time database and by accessing the by using backend developing.

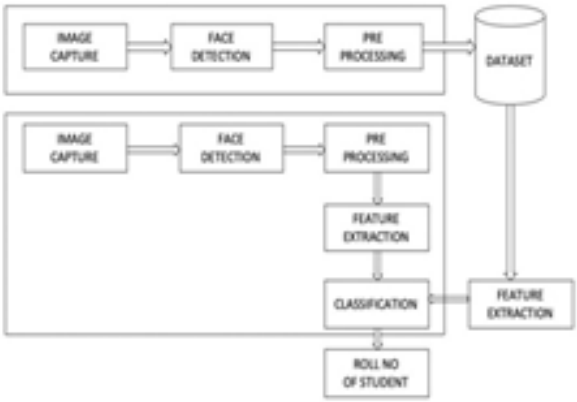


Fig 1: Block diagram of proposed implementation

The other types of algorithm that are the Viola Jones algorithm. This algorithm was proposed in 2001 by Viola Jones. This algorithm is very robust and it also work by recognizing the haar features in the image.

The next algorithm that is also very useful for this purpose is the Principal Component Analysis (PCA) algorithm. This algorithm makes use of dimensionality reduction and algebra concepts for face recognition. It makes use of eigen values and eigen vectors to reduce the dimensionality. The advantages of this algorithm are that it is easy to use, less expensive etc. But there are some limitations of this algorithm like it is sensitive to lights and shadows. It also requires proper alignment of the face for working properly.

The next algorithm that is available is the scale-invariant feature transform (SIFT).

IV.RESULTS

The faces were successfully detected using the haarcascade classifier technique. The faces were detected which a white box marked around them. The faces of each and every member of the group was detected. This is the first step in the detection of the images. The output is shown in the figure 2 below.

Fig 2. Face detection

From the above image, we came to a conclusion that the accuracy for the detection of the faces is an image is 100%. We also found that by including multiple faces in a video at a time.

REFERENCES

[1] Himanshu Tiwari. (2018), "Live attendance system via face recognition". https://www.researchgate.net/publication/325337917_Live_Attendance_System_via_Face_Recogn ition

[2] C.B. Yuvraj, M. Srikanth, V, Santosh Kumar.(2017) "An approach to maintain attendance using image processing techniques". https://www.researchgate.net/publication/323056180_An_approach_to_maintain_attendance_using_image_processing_techniques

[3] Dr. Mrinal kanti, Deb Barma, Nirmala Kar.(2012) "Study of implementing automated attendance system using face recognition techniques. https://www.researchgate.net/publication/274630584_Study_of_Implementing_Automated_Attendance_System_Using_Face_Recognition_Tech nique

[4] Neha Kumari Dubey, Dhanush Gowda. (2020) "Face recognition based attendance system" https://www.researchgate.net/publicat ion/342490735_Face_Recognition_based_Attendance_Sys tem

[5] Pooja G.R., Krishna A.N (2012) "Automated attendance system using image processing" https://www.ijana.in/Special%20Issue/S81.pdf

[6] Akshara Jadhav, Tushar Ladhe (2017) "Automated attendance system using face recognition" https://www.irjet.net/archives/V4/i1/IRJET - V4I1286.pdf

[7] Rabab Alhayam, Sani Salsabil (2019) "Face recognition automatic class attendance system" https://www.researchgate.net/publication/335648412_Face_Recognition_Automatic_Class_Attendance_System_FRACAS

[8] Shivani Kundale, Apurva Kamshetty (2017) "Automatic attendance using face recoginition" https://www.academia.edu/36847180/Automatic_Attendance_Using_Face_Recognition

[9] Payal Parekh, Goyani Mahesh (2019) "Face Recognition: Modern assessment of feature extraction" https://www.researchgate.net/publication/335804000_Face_Recognition_Modern_Assessment_of_Features_Extraction

This page is kept blank intentionally

GUI Based Handwritten Digit Recognition using CNN

Mr. Durgesh R. Pandey
Electronics and telecommunication department,
Thakur college of engineering and tecnology
Mumbai, India
durgeshrpandey2000@gmail.com

Mr. Abhishek M. Tiwari
Electronics and telecommunication department,
Thakur college of engineering and tecnology
Mumbai, India
abhishektiwari.amt@gmail.com

Mr.Ashwani V. Gupta
Electronics and telecommunication department,
Thakur college of engineering and tecnology
Mumbai, India
ashwanigupta0761@gmail.com

Mrs. Purnima chandrasekar
Electronics and telecommunication department,
Thakur college of engineering and tecnology
Mumbai, India
purnima.chandrasekar@thakureducation.org

***Abstract*— Nowadays artificial intelligence systems are being used everywhere. In that there are lots of systems which helps the human to do difficult things easily. GUI based handwritten digit recognition using Convolutional neural network 'CNN' is the system which fulfils the todays requirements which is nothing but recognition of handwritten digit. Because handwritten digits or alphanumeric may have different patterns or shapes. For computer it may difficult to classify as well as recognize that digit so that time neural networks come into the picture. Convolutional neural network CNN is used in this system because it can classify and recognize the digit very efficient manner. In this system CNN is used as main classifier as well as GUI and MINST data sets are being used for input training and testing for the system. Till now 50% work is completed i.e., CNN model has built. After completing training and testing it show the accuracy of 99.25% with the validation accuracy 99.23 and test loss 0.02912% and test accuracy 99.23%. After that compatible GUI is the next part for this system. Main aim of this system is to make efficient learning style.**

Keywords— ***Handwritten digit recognizer, CNN, MNIST dataset, hidden layers, GUI.***

I. INTRODUCTION

Increased in number of deep learning areas where various types of neural networks can be applied. In deep learning, convolutional neural network is being used in object detection, robotics, video analysis, segmentation, regression analysis natural language processing, speech recognition as well as image classification are some examples which have done using convolutional neural network. In these all-system high demand of accuracy recognition, consistence performance as well as lesser complexity are must because of they deal with large database [1].

Handwritten recognition of digit become a very large area where researchers can research for various future scopes for the system by updating weights which are going through the hidden layers. Basically, structure of neural network is divided into three parts first is input from where input enters. Second intermediate field or hidden layers where that weights are processed. Third part is output stage where output comes and also sends to previous layers for further process [2].

Hidden layers are playing most important role in neural network systems. Basically, whole process is depending upon the weights updating for desire output. As numbers of hidden layers increases accuracy of systems output also increases. But there is disadvantage, which is nothing but if hidden layers increase the complexity of the system are also increases with computation as well as it makes processes, more time consuming. [3]

This GUI based handwritten digit recognition using CNN is the system which helps to recognize the digits efficiently. Basically, this system is for the primary students as a product which help them to write a digit on it as well as this system will give instant result with respect to what they have written on GUI, which has provided by the system. [4]

This system further will be used in different kind of application like car number plate digit recognition, handwritten digits on cheque book or digits written on another document. Now there are systems present which does arithmetic operations on handwritten digit. [5].

This system will help further to recognize alphanumeric which helps to understand handwritten alphabetical as well as digits simultaneously. Main advantage of this system is its gives real time GUI supports by which user only have to give an input like drawing digits or alpha bate on it to a system, and system will instantly recognize that digit and give instant recognize digit as output.

II. BACGROUND OF HANDWRITTEN DIGIT RECOGNITION SYSTEM

From Reference [1], this paper focused on CNN accuracy at different Batch size and epochs. Addition of this system is to observe the variation in the overall classification accuracy by varying the number of hidden layers, batch size and also worked on finding performance of CNN's hidden layer, by using CNN and take reference as MNIST data set. The network is trained using stochastic gradient descent and the backpropagation algorithm. Scope of system is to adding feature like GUI to take real-time input. this reference paper will help to improve filters and layers efficiency.

From Reference [2],this paper focused on KNN and CNN's Error rate, advantage, disadvantages

.

MNIST data set are used and result is based on accuracy. By using algorithms, KNN's error rate is 3.8% and accuracy about 96.2% whereas in CNN's algorithms error rate is 1.9% and accuracy around 98.1%. Scope of system is to choosing CNN because it produces high accuracy then KNN and GUI improves user interface.

From Reference [3], this paper focused on ANN and accuracy at different layers, batch size and epochs. ANN has all layer with fully connection. Scope of system is to planning about using of convolutional neural network instead of artificial neural network because CNN is less complex as well as more efficient than ANN.

From Reference [4],Handwritten Digit Recognition using CNN.this paper focused on different neural network algorithm and used GUI for selection of algorithms compared different neural network. such as K-Nearest neighbour 'KNN', Support Vector Machine 'SVM', Random Forest Classifier 'RFC', and CNN.Scope of system is use CNN and GUI for Canvas input.

From Reference [5], The Four Arithmetic Operations for Handwritten Digit. Recognition Based on Convolutional Neural Network. this paper focused on combined dataset of MNIST dataset and arithmetic dataset. This dataset helps to calculation simple equation. Algorithms are used KNN, SVM, CNN, SNNs algorithms. In image rectification filter used are histogram equalization, median, normalization, etc and the accuracy of this system is 97.42%. Scope of system is to used CNN with GUI.

III. Steps for Proposed System

This section of paper focused-on block diagram, flow chart, algorithms, planning and description as well as programing structure of the system.

A. Block diagram

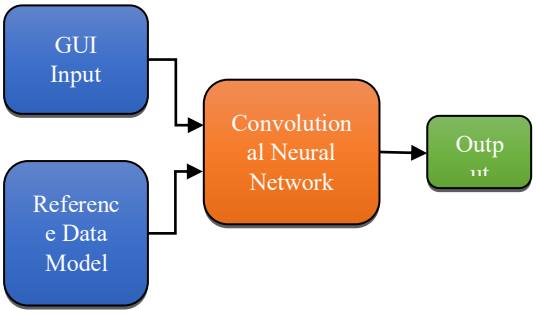


Figure 1: Purposed block diagram

From figure 1. is the basic block diagram of purposed GUI based handwritten digit recognition using CNN. In this block diagram first stage is input stage which consist of GUI input it gives canvas window to the user for drawing digit whereas reference data model which consist MNIST data set. This is used for training and testing for the CNN model.

Second stage is classifier which is based on CNN model this helps the system to classify and recognize the digits. The CNN model consists of different layer such as hidden layer, convolutional layer, RELU layer, max pooling layer and fully connected layer. the fully connected layer isclassifying the input with reference data set and gives output.

Final stage is output window on that result will be present as recognize digit with accuracy.

B. Data Flow Diagram

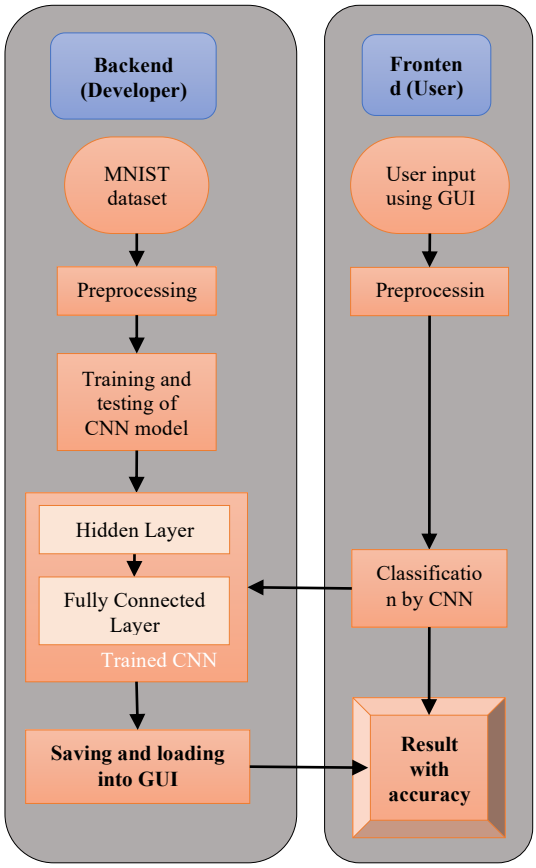


Figure 2: Purposed flowchart

From figure 2. shows flow chart of GUI based handwritten digit recognition using CNN. this system uses CNN model to recognize a handwritten digit and also providing a GUI window on which user can draw digit and get appropriate output.

Process in backend importing MNIST data set with required library like keras and tensor flow.Pre-processing the MNIST data set and training and testing of CNN model. Model will be saved and load to GUI.

Process in frontend asuser draw the digit. this input pre-processed and move to CNN model in backend on that it compare input with MNIST dataset and giverecognized output with accuracyto GUI window.

C. MNIST data set

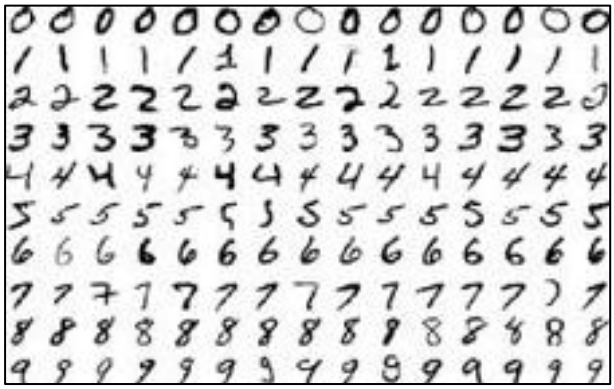


Figure 3: MNIST data set

Figure 3 shows the images of digits which contains by the MNIST dataset. There are lots of data set but most popular dataset for digits in neural network is MNIST data set. It contains 70000 images in which 60000 for training and 10000 for testing. MNIST data set have 10 different classes.

Thehandwritten digit's images are represented as a 28×28 matrix where each cell contains grayscale pixel value.

D. System disciption & planning

Currently, planning to create multi-layer neural feed forward network using and Keras and Tensor flow - an interface for expressing deep learning algorithms in Python. This network consists of perceptron's in layers that take inputs form GUI and pass information on to the next layer. In this system planning to build a CNN with multiple convolutions and maxpool layers and a final output layer with softmax activation.

Steps forbuilding Convolutional Network Architecture:

Convolution Layer. In this layer, convolutional filters are defined which are computed with input data to get the pixels features with most intensity value.

RELU layer. use for avoiding negative value.

Max pool Layer. It gets the data from the Convolution layer which come to this layer by RELU layer. It pools all the pixel values obtained from previous layer and again forms a new image matrix of a smaller size. These images goes to second set of hidden layer which contains layers like convolution, RELU as well as Max pooling layers and processed by system. And then again goes to next set of hidden layer. After that processed pixel values goes to fully connected layer.

Fully Connected layer. Softmax Classifier is applied that returns a list of probabilities for each of the 10 class labels. The class label with the largest probability is chosen as the final classification from the network. And this classification will give appropriate output.

IV. PROGRAMMING STRUCTURE

Model structure is divided into 5 section are as followed.

First section, Importing of libraries and load data set.In this step all libraries as well as loading of data set will complete. Libraries consist like keras as well as importing of keras models like sequential model, importing keras layers like dense, dropout, flatten. Importing of keras layer like convolutional layer, max pooling layer in 2D. Other hand in this step only loading of MNIST data set will complete.

Second section, Pre-processing the data.this step is present because input cannot directly transfer to the system so that there is need of pre-processing. In this step dimensions for the training data set is (60000,28,28,1).

Third section, Creation of model. this step is main part of system which is CNN model. In this section the system has set batch size 128 because it is standard chosen for trial and success fully done. Number of classes chosen 10 because 0 to 9 digits are present. Each digit consists one class. Epochs are 10 because at 10 epochs system gotten desired output. After that start of sequential model, The system uses three layer 32, 64 and 256 size hidden layer. Each one consists convolutional layer as well as RELU activation function and after that max pooling layer is present. After that fully connected layer has softmax activation function. Then model goes for compilation.

Fourth section, Training of model.in this step training part has done. This step is consist samples based on training data from MNIST data set, batch size, validation data, epochs as well as batch size.

In fifth section, Evaluation of model. in this testing has done. This testing has done by the 10000 data image which are provided by MNIST data set.

Here the 50% of system part is completed after that GUI work has started which will give real time input to the system which makes user friendly environment.

V. RESULT OBTAINED

In result section, output screen as well as discussion of result obtained has presented.

```
Using TensorFlow backend.
(60000, 28, 28) (60000,)
x_train shape: (60000, 28, 28, 1)
60000 train samples
10000 test samples
Train on 60000 samples, validate on 10000 samples
Epoch 1/10
60000/60000 [==============================] - 147s 2ms/step - loss: 0.3745 - accuracy: 0.8863 - val_loss:
0.0712 - val_accuracy: 0.9784
Epoch 2/10
60000/60000 [==============================] - 142s 2ms/step - loss: 0.1072 - accuracy: 0.9719 - val_loss:
0.0405 - val_accuracy: 0.9867
Epoch 3/10
60000/60000 [==============================] - 142s 2ms/step - loss: 0.0781 - accuracy: 0.9796 - val_loss:
0.0357 - val_accuracy: 0.9893
Epoch 4/10
60000/60000 [==============================] - 143s 2ms/step - loss: 0.0616 - accuracy: 0.9841 - val_loss:
0.0318 - val_accuracy: 0.9910
Epoch 5/10
60000/60000 [==============================] - 145s 2ms/step - loss: 0.0530 - accuracy: 0.9868 - val_loss:
0.0298 - val_accuracy: 0.9919
Epoch 6/10
60000/60000 [==============================] - 142s 2ms/step - loss: 0.0445 - accuracy: 0.9887 - val_loss:
0.0270 - val_accuracy: 0.9919
Epoch 7/10
60000/60000 [==============================] - 142s 2ms/step - loss: 0.0411 - accuracy: 0.9901 - val_loss:
0.0242 - val_accuracy: 0.9932
```

Figure 4: output window 1

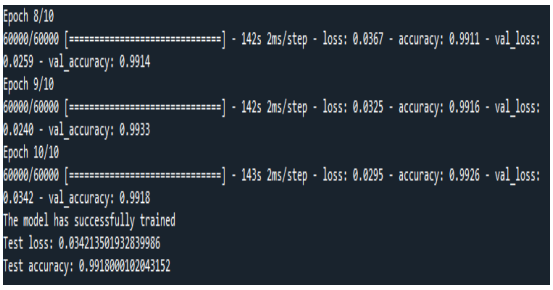


Figure 5: output window 2

figure 4&5. are the screenshot of output windows of the system which comes after training as well as testing part of the system. This output shows that model has success fully trained. Where it shows accuracy around 99.25%.

Till here 50% part of the system has completed i.e., CNN model of the system is now completed means base of system. This part is for classification purpose. Above figure 4 and 5 are showing that 60000 training samples have used for training purpose with 10 epochs. And after completing training and testing it show the accuracy of 99.25% with the validation accuracy 99.23% and test loss 0.02912% and test accuracy 99.23%.

VI. CONCLUSION

GUI based handwritten digit recognition using CNN is the system which gives the output as recognized digit. In this system uses Convolutional neural network which does image processing and classifies the digit using dot product. This system will provide GUI which make the system user friendly. 50% part of thesystem has done till. this system had made one model which gives accuracy 99.25% which shows model is successfully trained which shown in section V. For further 50% system will be going to associated with GUI which compatible with this model and which will make this system user friendly and by which user can give real time input and then system will give instant output.

ACKNOWLEDGMENT

We would like to thank our mentorsMrs. Purnima chandrasekar andDr. Vinitkumar Dongre (TCET) for their valuable suggestions as well as comments that helped us for improving this paper, this support is greatly appreciated.

REFERENCES

[1] Fathma Siddique and Shadman Sakib, “Recognition of Handwritten Digit using Convolutional Neural Network in Python with Tensor flow and Comparison of Performance for Various Hidden Layers” CSE, EEE, March 2019.

[2] Tanya Makkar and Yogesh Kumar, “Analogizing Time Complexity of KNN and CNN in Recognizing Handwritten Digits”, ICIIP, March 2017.

[3] Md. Abu Bakr Siddique1 and Mohammad Mahmudur Rahman Khan, “Study and Observation of the Variations of Accuracies for Handwritten Digits Recognition with Various Hidden Layers and Epochs using Neural Network Algorithm”, EEE, ECE, March 2018.

[4] Vijayalaxmi R Rudraswamimath and Bhavanishankar, “Handwritten Digit Recognition using CNN”, ISSN, June 2019

[5] Kecheng Wang and Junwen Deng, “The Four Arithmetic Operations for Handwritten Digit Recognition Based On Convolutional Neural Network”, FIM, WU, February 2020.

Low Cost Heart Beat Measurement System and Oximeter

Kirti Moily
E&TC
TCET
Mumbai, India
kirtimoily0605@gmail.com

Nivedita Mishra
E&TC
TCET
Mumbai, India
niveditamishra3011@gmail.com

Vedhashree Naik
E&TC
TCET
Mumbai, India
vedhashreenaik11@gmail.com

***Abstract* - There is a need of technology in healthcare as in death due to cardiac arrest at home is increasing day by day. Heart rate and blood oxygen saturation is monitored in this project to provide information regarding the health of the body. It can be used whenever you fell sick and instant medical test is not possible. The Max30100 sensor is playing a major role in this project as it measures both heartbeat rate as well as blood oxygen percentage. By measuring the intensity change of light transmitted through tissue due to arterial blood, heart rate is measured. Furthermore, oxygenated blood has different light absorption characteristics than deoxygenated blood under red and infrared wavelengths. The design is small, easy to use, real time method to provide information regarding health. The advantage over here is that this product can be used by any non-professional.**

Keywords - Beat per minute (BPM), Pulse oximetry, SPO2

I. INTRODUCTION

Heart rate measurement is one of the very important parameters of the human cardiovascular system. World Health Organization (WHO) research shows that most people were dying due to heart illness. Therefore, this disease cannot be taken lightly and need constant monitoring of cardiac parameters. The heart rate of a healthy adult at rest is around 72 beats per minute (bpm)[1]. The average heart rate is between 60 to 100 bpm.

Consequently, heart rates outside this range could lead to an indication of medical conditions. Oxygen saturation depends on the concentration of haemoglobin in red blood cells, where the average value is 95 to 100%. Here Arduino is used which is a programmable device that can sense and interact with its environment and the MAX30100 sensor is used to calculate %oxygen in blood and heart rate in bpm and both the readings are displayed in LCD. Wireless transmission is becoming increasingly popular in healthcare and biomedical engineering. The purpose of this study is to create a low-cost device that can calculate % oxygen in blood and heart rate in bpm.

II. CIRCUIT DIAGRAM

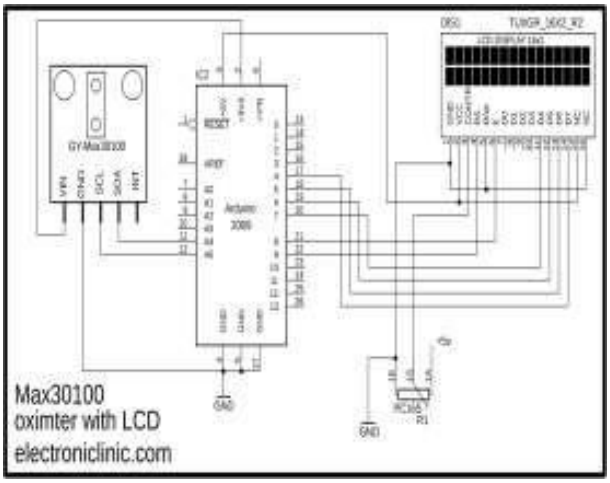


Fig. 1

III. LITERATURE SURVEY

1. From the study we find out that Abnormal Condition of heart rate and oxygen saturation can be detected easily and data can be sent to doctor from PC through email for further diagnosis. But Various methods and formulae are used to calculate heart rate and opamp, microcontroller is used due to which circuits is complex and can give errors.

2. It had heart rate monitoring, oxygen saturation and body temperature device based on Arduino platform synchronized with android application via Bluetooth. but specific details were missing like the components used, circuit diagram, so it was difficult to get a clear idea from the paper.

3. First IR light is transmitted by IR sensor to the fingertip and then reflects light on a photodiode Rx sensor and converted to a suitable signal by signal conditioning and suitable signal was sent to micro controller and finally heart rate is measured. But due to more number of components used, the circuit was more complicated.

4. Proposed patient health monitoring system is calculated for certain parameters like heartbeat, body temperature, blood pressure and decisions can be made based on data obtained from IoT website. But lots of

components are being used which increased the overall cost of the product.

IV. PROBLEM DEFINITION

•There is a marked increase in deaths from cardiac arrest at HOME.
•In the current lockdown situation, oximeters are been used widely, but they are very expensive.
•Low cost device is needed that can find out oxygen content in blood and which can also calculate heartbeat rate.

V. PROPOSED METHODOLOGY

•In this project the heart rate (BPM) along with blood oxygen is displayed on the LCD display.
•Put your finger on the sensor and you can successfully read the bpm and blood oxygen value.
•When you connect 16 x 2 LCD display with Arduino along with 10k potentiometer, the bpm and blood oxygen value will be displayed.
•So basically 30100 sensors are the pulse oximetry and heartrate monitor which is used to check the health of a person with any condition that affect blood.
•Max30100 sensor combined 2 led of photo detector, optimized optics and low noise analog signal program.
•To reduce the cost instead of using 2 different sensors max30100 sensor is used which can calculate percentage oxygen along with heartbeat rate.
•While using the Max30100 sensor make sure that the figure is placed properly and is stable for getting accurate reading.

TABLE I. PRESENT VALUES OF HEART RATE

Age	Heart Rate (BPM)
15 years-adult	<60
1-2 days	>159
3-6 days	>166
1-3 weeks	>182
1-2 months	>179
3-5 months	>186
6-11 months	>169
1-2 year	>151
3-4 year	>137
5-7 years	>133
8-11 years	>130
12-15 years	>119
>15- adult	>100

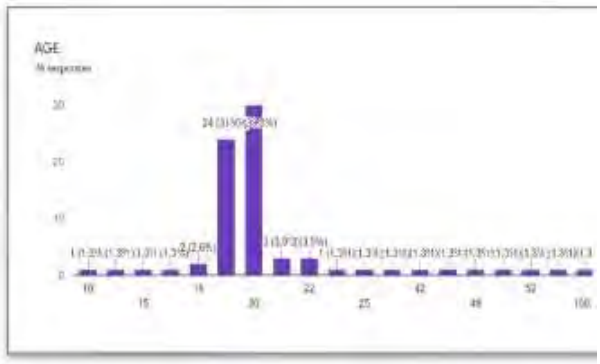
TABLE II. PRESENT VALUES OF SPO2

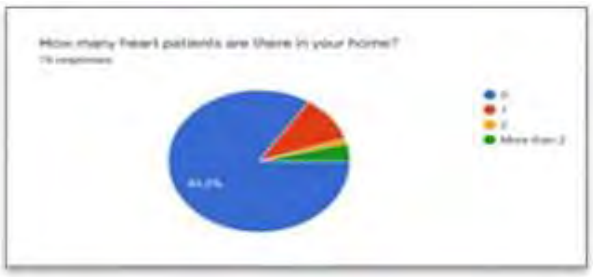
SPO_2 Reading	Interpretation
95-100	Normal
91-94	Mild hypoxemia
86-90	Moderate hypoxemia
<85	Severe hypoxemia

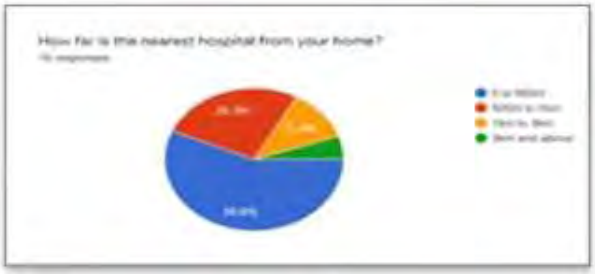
VI. NOVELTY IN THE PROJECT

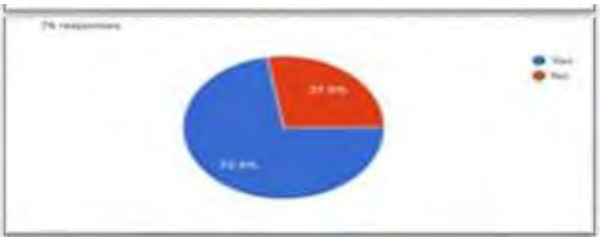
•Most of the measurement devices either measures bpm or oxygen percentage in blood, but here is a device which measures both at same time.
•It is observed that the individual device is way more costly than our device which has dual features in same rate or may be less.

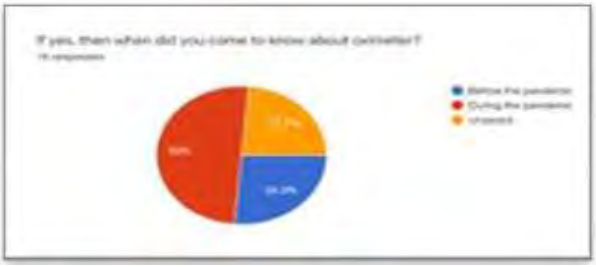
VII. SURVEY

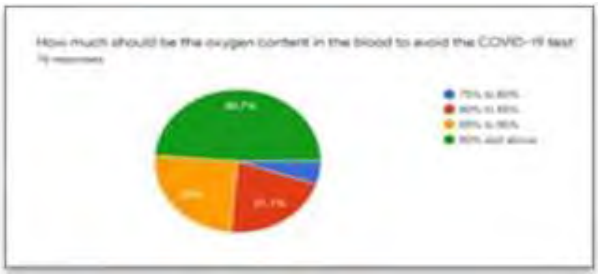


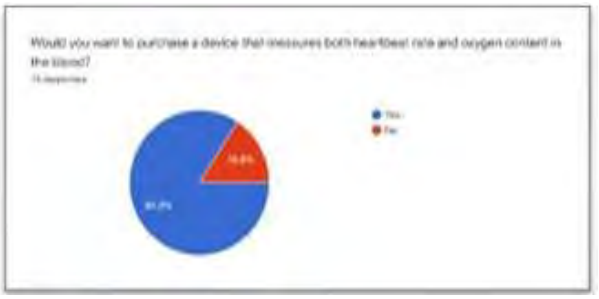


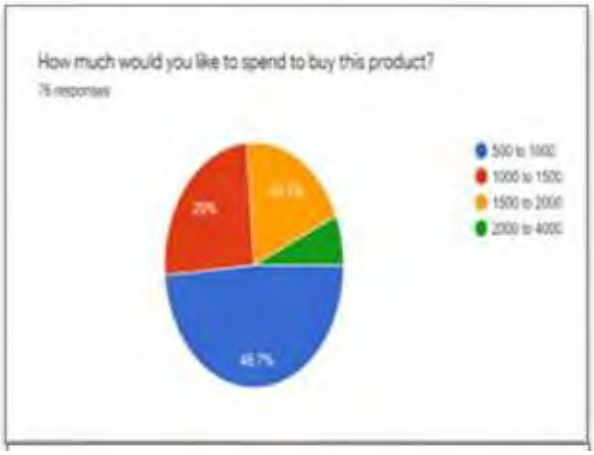


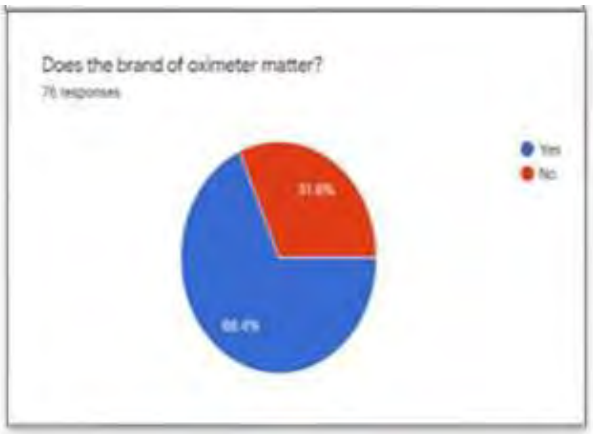












VIII. CONCLUSION

The purpose of this paper is to develop a low-cost device that can calculate %oxygen in blood and heart rate in bpm. It can monitor SPO2, heart rate and based on the monitor values it can analyze the health status. By Placing the finger on the sensor the heart rate in bpm and SPO2 reading will be displayed on the Lcd screen display. For accurate reading place your finger properly without moving on the max30100 sensor. The device has an advantage that it can be used by non-professional people at home easily and it is a wireless device.

IX. ACKNOWLEDGMENT

This research could not have been possible without the contribution of members. Thank you to Thakur College of Engineering & Technology who encouraged us to write a paper. Our mentor, Ms. Rutvi Thakar helped us throughout the development phase of the project. Also, a hearty thank you to our friends and teachers who bestowed an inexhaustible reservoir of help and sources that aided us through the problematic situation while writing the paper.

REFERENCES

[1] Esrat Jahan, Tilottoma Barua, Umme Salma. "An Overview On Heart Rate Monitoring And Pulse Oximeter System" pp 148-152, October
2014.
[2] Radwa Sameh, M. Genedy, A Abdeldayem, Mohamed H. Abdel azeem, "Design and Implementation of an SPO2 Based Sensor for Heart Monitoring Using an Android Application".
[3] Hamidreza Shirzadfar, Mahsa Sadat Ghaziasgar, Zeinab Piri, Mahtab Khanahmadi, " HeartBeat Rate Monitoring Using Optical Sensors", March 2018
[4] Hamidreza Shirzadfar, Mahsa Sadat Ghaziasgar, Zeinab Piri, Mahtab Khanahmadi, " HeartBeat Rate Monitoring Using Optical Sensors", March 2018
[5] Franchini Roberto, "Automatic heartbeat monitoring system", Submitted: 19 September
2019 | Approved: 27 September 2019 | Published:
30 September 2019
[6] Dogan Ibrahim, Kadri Buruncuk, "Heart Rate Measurement From The Finger Using A Low- Cost Microcontroller", pp 1-4, September, 2005. [7] Robert F. Coughlin, Frederick F. Driscoll, ISBN-81-203-2096-4, India Private Limited, New Delhi-110001, 2003, Sixth Edition.
[8] Dilpreet Kaur, Sukhwinder Kumar, Shashi Sharma, "Online Graphical Display of Blood Oxygen Saturation and Pulse Rate", International Journal of Scientific & Engineering Research Volume 2, ISSN 2229-5518, Issue 6, June-2010

This page is kept blank intentionally

Optical Steganography for Security Enhancement

Aniket Narpatraj Bafna
Department of Electronics and Telecommunication Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
aniketbafna0@gmail.com

Mahek Modi
Department of Electronics and Telecommunication Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
mhkmodi@gmail.com

Shrushti Sabhapati
Department of Electronics and Telecommunication Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
shrushtisabha223@gmail.com

Ms. Sonia Behra
Department of Electronics and Telecommunication Thakur College of Engineering and Technology
Mumbai, Maharashtra, India
sonia.behra@thakureducation.org

***Abstract*— This paper provides securing data flowing in optical fiber through steganography. Steganography is process that involves hiding a message in a carrier, then the carrier is sent to receiver without anyone else knowing that it contains a hidden message. The original files can be referred to as cover text, cover image, cover audio or cover video. This paper provides an overview of steganography and steganography technique to secure data i.e. video.**

Keywords — Steganography, optical fiber, hiding data, security,

I. INTRODUCTION

Since security is one of the important issues in our day to day life. Everywhere such as banks, shops etc. we require security. Password can be used to access our private information. Because of that data security is one of the most important fields which overcome the problem of data leakage and its misuse. This proposed technique come sunder data security which can be used to provide more security. The main motivation of this paper is to provide high level security to sensitive digital data against eve droppers, while keeping the operational time low. This can be achieved by encrypting and authenticating the video (image + audio) that has user's sensitive data and then embedding the resultant document on to a carrier. Also since the, exponential growth of technology in every aspect of life is observed. And improvement of technology provides facilities to both users and hackers/intruders too. Advancement in this technology encourages hackers/intruders activities which results in lack of security to user's confidential data.Themost common and popular techniques for data hiding that is being used in this paper is steganography.

The primary idea behind developing this project is to protect confidential data from an intruder's counter-attacks and to block the intruder through various levels in his/her attacks. In today's world, we often listen to the popular term "Hacking". Hacking is nothing but unauthorized access to data that can be collected at the time of data transmission. Concerning steganography, Steganography is the science of hiding information. In steganography information can be hidden in carriers such as images, audio files, text files, and video and data transmissions. When message is hidden in the carrier a stego carrier is formed for example a stego-video. Steganography hides the message so that there is no knowledge of the existence of the message in the first place. Steganography includes the concealment of information within computer files. In digital steganography, electronic communications may include steganography coding inside of a transport layer, such as a document file, image file, program or protocol. Steganography today, however, is significantly more sophisticated, allowing a user to hide large amounts of information within image and audio files. In this project video steganography is used for securing secrete video respectively. So, whatever be the technique will be developed in the future, the degree of security-related with that has to be kept in mind.

One of the most important issue in networking is the tremendous demand for a huge bandwidth with a great Security. Optical network is an efficient telecommunications networks used to transfer data with great facilities. To provide an additional capacity for higher bandwidth, different frequencies and longer distance, optical Dense Wavelength Division Multiplexing (DWDM) and Erbium- Doped Fiber Amplifiers (EDFA) will be used. Currently many steganography techniques have come into existence. Encoding of plain text is achieved using DES, AES, Triple DES, RSA and many other algorithms. Any individual can use its own approach as encryption method. As described above all the available techniques used in early tools are old and follow some specified process with some improvements to previously proposed techniques. This makes the intruders work easy. The intruder may try a counter attack by making some changes to counter existing techniques. None of the existing techniques offers protection through multiple levels. That is one of the reasons why an intruder is able to view/obtain hidden data with just one or two attacks.

II. RESEARCH BACKGROUND

Bernard B. Wu and Evgenii E. Narimanov [1] In the paper, they have emphasized the various advantages of Fiber optics but since over the past two years, it has been seen that fiber optics can be extracted through various taping methods. And one of the famous taping

methods is the Optical taping Method. To overcome this we use Steganography Method.

Arwa Moosa and May Hattim [2] An optical network is an efficient telecommunications network used to transfer data with great facilities. To provide additional capacity for higher bandwidth, different frequencies and longer distance, optical Dense Wavelength Division Multiplexing (DWDM), and Erbium-Doped Fiber Amplifiers (EDFA) will be used. To transfer data securely, an important encryption method RC4 will be used to protect data on the common channel as its cryptographic technique is faster, simpler to implement and the key stream is an arbitrary sequence of bits which guarantees the security of the used cipher. MATLAB program will be used to encrypt and decrypt the image by transferring it optically by the Optical system simulation program.

Harpreet Kaur, Jyoti Rani [3] the paper surveys the different types of Steganography and techniques to detect bsteganography. All the techniques discussed in this paper can secure the hidden data. Steganography used in the text, image, video, audio to hide the data. There are different techniques of Steganography used in different domains as per requirement such as Spatial Domain, Transform Domain, Vector Embedding Spread spectrum, Statistical Technique, Distortion Techniques, Masking, and Filtering & comparison is made from different techniques.

III. RESEARCH METHODOLOGY

After various research about audio steganography and image steganography works, the concept of what is Steganography process and how Steganography techniques are used is known. Then acquiring the desired Steganography techniques the process is carried out. After that the implementation of code and then implementation of data transfer is being done. Then there is set up for communication between one computer and other computer through optical fibers which will be carried out. Then the testing of the project is done.

IV. PRPOSED SYSTEM

The given Fig 1 describes the methodology in the proposed system, basically for security purposes we are using fiber optics cable for transmission of data. To send and receive the message from one computer to another we are using MATLAB software and the algorithm which has the best efficiency as compared to another algorithm is AES (Advanced Encryption Standard). From the sender side, a cover text or image is required to be inserted in the system from which the secrete message is to be transferred, this secrete message is to be encrypted with a secret key for the ciphertext (i.e. any one method) then encryption of embedded object is done with the key, after doing this all the data is hidden in a cover text and then it is being transferred to the receiver through the fiber optics cable then at the receiver side we have to extract the cover image or cover text with the private keys used for encryption, the text is then decrypted and the secrete text is revealed. Since there are algorithms and coding available for image & text steganography it can be easily implemented by deciding which method or techniques is limited to the different file formats. Whereas for Audio & video steganography there is no particular method or coding available for different file formats.

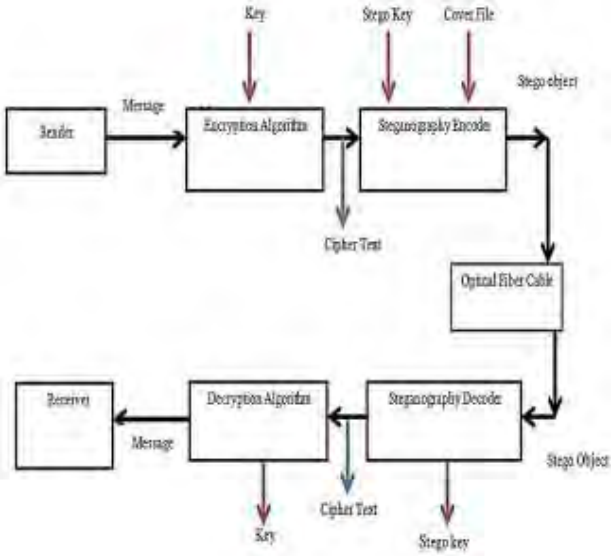


Fig. 1. Block Diagram of Steganography process

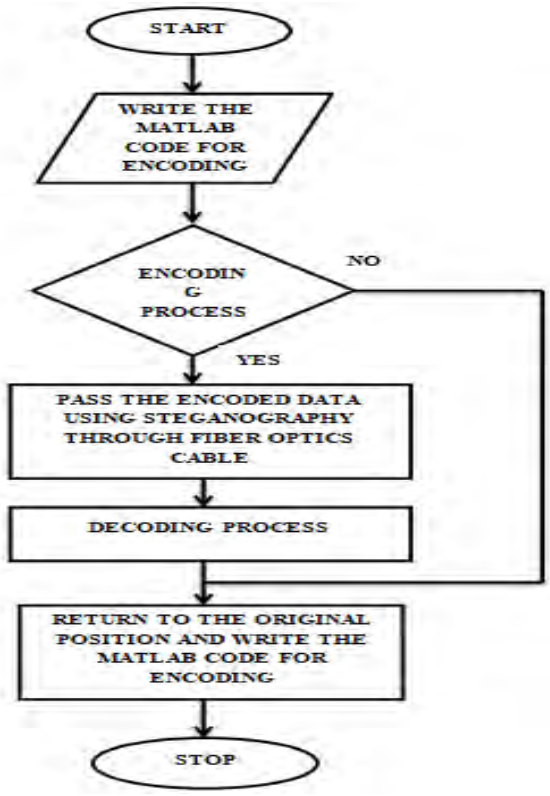


Fig. 2. Data flow Diagram

V. VIDEO STEGANOGRAPHY

Video files are generally a collection of images and sounds, so most of the presented techniques on images

and audio can be applied to video files too. The great advantages of video are the large amount of data that can be hidden inside and the fact that it is a moving stream of images & sounds. Therefore, any small out otherwise noticeable distortions might go unobserved by humans because of the continuous flow of information.

VI. RESULTS

Performance analysis - Performance measure for video distortion because of hiding of message video is done by calculating PSNR value which is given as follows:
PSNR = 10log (Cmax)2 / MSE.
MSE = mean - square – error,
which is given as:
MSE = 1 / MN((S-C) 2.
Cmax = 255.
Here M and N are image dimensions, S is the stego image and C is a cover image. If PSNR value is less than 30 dB then indicates low quality and if it is 40 or above that then high quality. In order to measure the performance several parameter are given as below:
Perceptibility: It means embedding the data in cover medium up to a visually unacceptable level.
Capacity: Amount of data can be hidden. Robustness to attacks: Type of attach on a stego image to read, access or destroy the embedded data.

Table 1.Comparison of the characteristics for LSB algorithm

Technique Imperceptibility Capacity Robustness	**Technique Imperceptibility Capacity Robustness**	**Technique Imperceptibility Capacity Robustness**	**Technique Imperceptibility Capacity Robustness**
LSB	LSB	LSB	LSB

VII. CONCLUSION

Since fiber serves as an essential supporting infrastructure for wireless and other network and has real strength lies closer to the core of the network than that at the edges. It provides high data rate in gigabyte per second with good quality link, but it is always expensive when compared to other technologies. However, in recent times Fiber optics has been subjected to many security challenges which made them to be susceptible to many physical attack and accidents which include; fiber cut and tapping, fiber clamping and fiber splicing, etc. For this this paper has used a famous terminology know as Steganography which is the art and science of communicating in a way which hides the existence of the communication. In the process of steganography, the carrier which hides the message in it will be sent to the receiver the carrier gives the receiver no information about the message but reveals it only after using the tool or algorithm that is used by the sender. For securing data flowing through fiber optics cable.

REFERENCES

[1] Ms. Babita Rawat, Mr. Mukesh Sone “Securing Data in Fiber Optics”, International Journal For Research In Applied Science And Engineering Technology (IJRASET), Vol. 2 Issue VII, ISSN: 2321-9653, July 2014

[2] Arwa A. Moosa, May Hattim “Telecommunication of a Secure Data in Optical Fiber”, Al-Mansour Journal, January 2017

[3] Mrs. Harpreet Kaur, Mrs. Jyoti Rani “A Survey on different techniques of steganography”, International Conference on Advanced Engineering and Technology- 2016, DOI:10.1051/matecconf/2016570

[4] Kamred Udham Singh “Video Steganography: Text Hiding In Video By LSB Substitution”,Kamred Udham Singh Int. Journal of Engineering Research and Applications, ISSN: 2248-9622, Vol. 4, Issue 5 (Version 1), pp.105-108, May 2014

[5] A Secure Data Communication System Using Enhanced Cryptography and Steganography. Article in International Journal of Innovative Research in Computer and Communication Engineering · June 2017

This page is kept blank intentionally

Prediction of Graduate Admissions Using Regression Models

Naman Joshi
E&TC department,
Thakur College of Engineering and Technology, Mumbai,India
,joshinaman1741@gmail.com

Rohit Gupta
E&TC department
Thakur College of Engineering and Technology,
Mumbai,India,
rohitg347@gmail.com

Vivek Gupta
E&TC department,
Thakur College of Engineering and Technology,
Mumbai,India,
vg8355@gmail.com

Purnima Chandrasekar
E&TC department,
Thakur College of Engineering and Technology, Mumbai, India,
purnima.chandrasekar@thakureducation.org

***Abstract*— Admission into American University is a dream come true for many students across the globe. As the second largest population of foreign students in America comes from India, it is very important for the Indian students to know the criteria for admission when they are competing with a large chunk of Indian crowd as well as foreign crowd. Hence, we came up with this idea of predicting the chance of admit in American Universities. We have used a dataset which is available online. The dataset consists of important parameters like the GRE score, TOEFL score, CGPA score, etc. The data is mostly of Indian students and hence this data will be of high quality when it comes to Indian students who want to pursue their education in United States of America. Before the prediction process, we have done performed various preprocessing techniques on the data which will clean the data in terms of value normalization, etc. Then for the prediction process, we have used Linear Regression, Decision Tree Regression and Random Forest Regression models for prediction and compared the same. Linear Regression performs the best when compared with other models.**

Keywords*— *Machine Learning, Linear Regression, Decision Tree Regression, Random Forest Regression, Graduate Admissions.

I. Introduction

We know that the formal education in terms of universities started from Europe in around 1090 A.D [1]. This fact gives us the idea that these universities have a lot of experience in terms of getting students into their university. So, it's very important to understand the specifications of what the university sees in a student while evaluating their profile.

The Graduate Program is an exhaustive task that requires thorough preparations, both in terms of building a noteworthy profile and choosing universities that offer relevant programs. We aim to bring students closer to their university of choice through a robust evaluation of their profiles. A good number of predictors and consultancy services fail in understanding the admission procedure and either suggests extremely ambitious schools or lower ranked ones. In this paper, we have included parameters that are all relevant for graduate admissions. Barring a few exceptional cases in which a student may unexpectedly fetch admit in a top school, most of the results are as expected and give a fair idea about the selection criteria. Reference[2] consists of similar evaluation of profiles where in the author of this paper compared the different models such as Linear Regression, Support Vector Regression, Decision Tree Regression and Random Forest Regression for prediction of chance of admission. The downside of this paper is that the evaluation parameters are giving poor results in terms of R2 score. Reference [3] consists of four prediction models by applying four well-known data mining classification techniques, namely: Artificial Neural Network (ANN), Decision Tree, Support Vector Machine (SVM), and Naive Bayes. The shortcoming of this paper is that all classification techniques were applied on data collected from a single university. Thus, to validate these findings further, more studies should use data from multiple universities. In addition, further studies are needed to consider more admission factors.

In the proposed framework of [4] consists of two sites. One of them is called local site. It consists of Application layer, Middleware and Meta Data directory. The other one is Remote Site. It consist Data warehouses at different servers. In this paper, the new algorithm is introduced with Binary Search Tree which stores the global rules by combining the local rules generated at each site. This Global Rule Binary Search Tree can be used for college prediction. The research gap in this paper was that the extraction of educational data is an emerging and uncovered area for research work of Data mining. Data mining techniques can be useful in deriving patterns from educational data, and this pattern can be useful to improve Education System. This research work can be helpful for any Educational System. Security is the major concern, so in future the security parameters can also be considered. Reference [5] and [6] consists in depth analysis of the techniques such as web scraping which can be used for making a dataset. There are many techniques to do web scraping as mentioned in the papers. For this project, we used a dataset which was readily available online. But, in order to compare whether the dataset is genuine or not, we compared the dataset with the one which we actually made with the help of web scraping.

II. Proposed Implementation

To understand the flow of the whole process of prediction, we have illustrated a flow diagram in fig. 1. The whole process is divided into five main parts. The most important part in the whole process is the preprocessing of the dataset. This is due to the fact that, no matter how good the model is for evaluation, if the data given to the model has no correlation, then any model will fail.

A. Exploratory Data Analysis

The dataset used has been first analyzed in terms of the distribution of values. For this, firstly the mean and the standard deviation were analyzed in fig.2. There are 500 rows in the dataset. According to fig. 1 we can understand that the mean of the values of variables seems to be above the middle value.

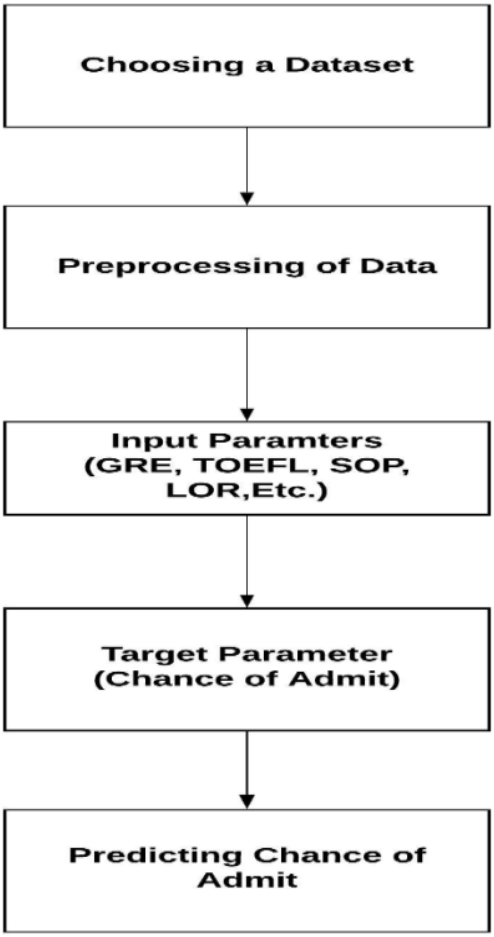


Fig. 1 Flow Diagram of the project

	GRE Score	TOEFL Score	University Rating	SOP	LOR
count	500.000000	500.000000	500.000000	500.000000	500.00000
mean	316.472000	107.192000	3.114000	3.374000	3.48400
std	11.295148	6.081868	1.143512	0.991004	0.92545
min	290.000000	92.000000	1.000000	1.000000	1.00000
25%	308.000000	103.000000	2.000000	2.500000	3.00000
50%	317.000000	107.000000	3.000000	3.500000	3.50000
75%	325.000000	112.000000	4.000000	4.000000	4.00000
max	340.000000	120.000000	5.000000	5.000000	5.00000

	CGPA	Research	Chance of Admit
count	500.000000	500.000000	500.00000
mean	8.576440	0.560000	0.72174
std	0.604813	0.496884	0.14114
min	6.800000	0.000000	0.34000
25%	8.127500	0.000000	0.63000
50%	8.560000	1.000000	0.72000
75%	9.040000	1.000000	0.82000
max	9.920000	1.000000	0.97000

Fig. 2. Description of the dataset(mean and standard deviation)

The second thing which we analyzed was the structure of data according to the university rating which can be seen in fig. 3. We can observe that the relation seems to be linearly distributed and hence it would not hinder our process of prediction. Then we analyzed the correlation of all the variables which can be seen in fig. 4. Correlation measures the extent to which two variables can be related to each other. According to the figure, we can see that the GRE score, CGPA and the TOEFL score has the highest correlation with the chance of admit. So, these variables will have the highest say in terms of predicting the chance of admit. The dataset which is present in the [7], has been analyzed with the help of different machine learning models such as Linear Regression, Random Forest Regression and Decision Tree Regression.

B. Linear Regression

Linear Regression is one of the easiest regression models used to predict results. The relationship between the independent variable and the dependent variable is modeled. In the dataset which we used, it has multiple independent variables and hence we used Multiple Linear Regression. “Multiple linear regression attempts to model the relationship between two or more explanatory variables and a response variable by fitting a linear equation to observed data. Every value of the independent variable x is associated with a value of the dependent variable y.” [8].

$$y = b_1x_1 + b_2x_2 + b_3x_3 + \ldots + b_nx_n \quad (1)$$

The above equation is of Multiple Linear Regression which consists of y as the single dependent variable and x_n as the independent variables.

University Rating	GRE Score	TOEFL Score	SOP	LOR	CGPA
1	304.911765	100.205882	1.941176	2.426471	7.798529
2	309.134921	103.444444	2.682540	2.956349	8.177778
3	315.030864	106.314815	3.308642	3.401235	8.500123
4	323.304762	110.961905	4.000000	3.947619	8.936667
5	327.890411	113.438356	4.479452	4.404110	9.278082

University Rating	Research	Chance of Admit
1	0.294118	0.562059
2	0.293651	0.626111
3	0.537037	0.702901
4	0.780952	0.801619
5	0.876712	0.888082

Fig. 3.Distribution of data according to University Rating

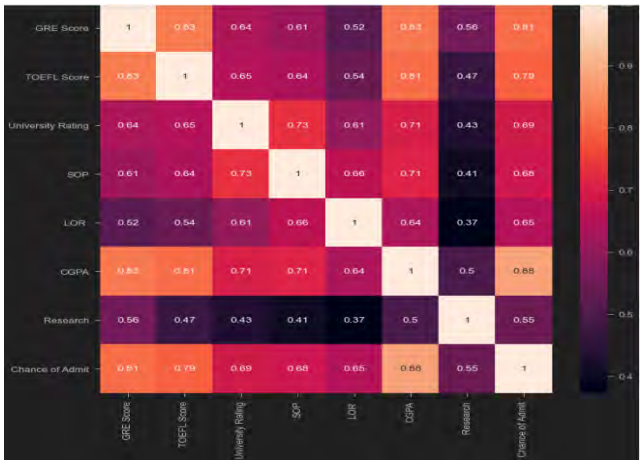


Fig. 4 Correlation matrix of the variables

C. Decision Tree Regression

Decision Tree uses a flowchart-like structure or is a model of decisions and all of their possible results, including outcomes, input costs, etc. Decision-tree algorithm is a part of supervised learning. It works for both continuous as well as categorical output variables. The branches/edges represent the result of the node and the nodes have either:

1) Conditions [Decision Nodes]

2) Result [End Nodes]

"Decision tree regression observes features of an object and trains a model in the structure of a tree to predict data in the future to produce meaningful continuous output. Continuous output means that the output/result is not discrete, i.e., it is not represented just by a discrete, known set of numbers or values" [9].

D. Random Forest Regression

The sensitivity of decision trees depends on specific data on which they are trained. The changes in the training data can result into a different decision tree and in turn the predictions can be quite different. Training in decision tree can be computationally expensive and it carries a big risk of overfitting. Since they cannot go back after the splitting of data is done, it tends to find local optima. To address these limitations, we try with Random Forest. Random forest comes into the category of Supervised Learning algorithm. It uses ensemble learning method for classification and regression. "Random forest is a bagging technique and not a boosting technique. The trees in random forests are run in parallel. There is no interaction between these trees while building the trees. It operates by constructing a multitude of decision trees at training time and outputting the class that is the mode of the classes (classification) or mean prediction (regression) of the individual trees" [10]. The below fig. 5 illustrates the process of Random Forest.

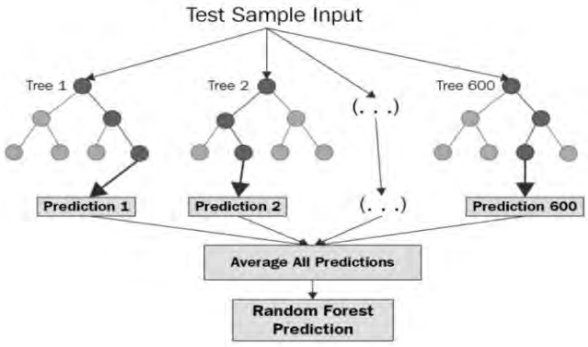


Fig. 5 Random Forest Structure[10]

Before these models could be applied, the dataset is gone through the process of Standard Scaling. "Standardization is done by removing the mean and scaling it to unit variance. Standardization of a dataset is a common requirement for many machine learning estimators: they might behave badly if the individual features do not more or less look like standard normally distributed data (e.g. Gaussian with 0 mean and unit variance)" [11].

After the data is scaled, it is split into training and the testing set. For our project, we have kept the test size to be 15 percent

III. RESULTS

Once the model is trained, the evaluation parameters are calculated on the testing data. Following is the importance of the calculated evaluation parameters.

A. Importance of evaluation parameters

R Square is a good parameter to determine how well the model fits the dependent variables. However, the problem of overfitting is not taken into consideration. If the regression model has many independent variables, because the model is too complicated, it may fit very well to the training data but performs badly for testing data. That is why Adjusted R Square is brought into the scenario because it will penalize additional independent variables added to the model and adjust the metric to prevent overfitting issue. While R Square is a relative measure of how well the model fits dependent variables, Mean Square Error is an absolute parameter of the goodness for the fit. It gives an absolute number on how much you're predicted results deviate from the actual number. We cannot interpret many insights from one single result but it gives a real number to compare against other model results and helps to select the best regression model. The square root of MSE is Root Mean Square Error (RMSE). It is used more commonly

than MSE because sometimes MSE value can be too big to compare easily. Secondly, MSE is calculated by the square of error, and thus square root brings it back to the same level of prediction error and makes it easier for interpretation. Mean Absolute Error (MAE) is similar to Mean Square Error (MSE). However, instead of the sum of square of error in MSE, MAE is taking the sum of absolute value of error [12].

B. Linear Regression

The model which performed the best for us was Linear Regression. Following are the values of the main evaluation parameters of the regression model.

TABLE I. LINEAR REGRESSION

EVALUATION METRIC	VALUES
Mean Squared Error (MSE)	0.002458
Root Mean Squared Error (RMSE)	0.05
Mean Absolute Error (MAE)	0.03939
R2 Score	0.8951
Adjusted R2 Score	0.8842

The performance of the model can be seen through the following fig. 6 which illustrates the predicted values.

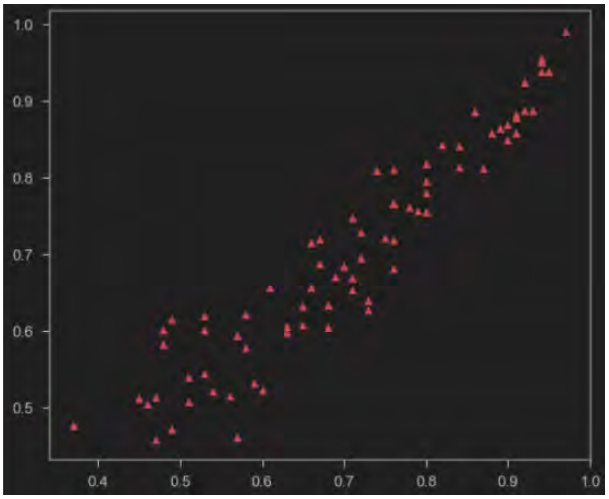


Fig. 6 Predicted values of original data

C. Decision Tree Regression

This model performed quite well but not as good as Linear Regression or Random Forest. We can see an immediate jump in the values of all errors evaluated. Following are the values of the main evaluation parameters of the regression model.

TABLE II. DECISION TREE REGRESSION

EVALUATION METRIC	VALUES
Mean Squared Error (MSE)	0.16407
Root Mean Squared Error (RMSE)	0.405
Mean Absolute Error (MAE)	0.2940
R2 Score	0.8609
Adjusted R2 Score	0.8464

Maximum depth of the tree has been kept as 4 and the parameter 'criterion' has been set to mean absolute error.

D. Random Forest Regression

This model performed better than Decision Tree but less than Linear Regression. Following are the values of the main evaluation parameters of the regression model. We can see that all the parameters have improved when compared to decision tree.

TABLE III. RANDOM FOREST REGRESSION

EVALUATION METRIC	VALUES
Mean Squared Error (MSE)	0.13248
Root Mean Squared Error (RMSE)	0.364
Mean Absolute Error (MAE)	0.2564
R2 Score	0.8877
Adjusted R2 Score	0.8759

IV. Conclusion

In this paper, we have successfully predicted the chance of admit with the help of various machine learning models. The fact that Linear Regression is performing the best among the evaluated three models; the reason for that can be attributed to the analysis which was done in Exploratory Data Analysis. The linear dependency of the data is the major key factor.

TABLE IV. PERFORMANCE ANALYSIS

MODEL	R2 SCORE	MSE
LINEAR REGRESSION	0.8951	0.002458
DECISION TREE REGRESSION	0.8609	0.16407
RANDOM FOREST REGRESSION	0.8877	0.13248

The major factors which influence the decision making can be seen from the correlation matrix. The reason for the error in the model can be attributed to the outliers present in the data.

V. Future Scope

There is another dataset which we have made. It also includes columns such as work experience, University name and branch names. So, in future we could further analyze this data and could actually predict which university a person can go to. The major part here is that, it also includes the branch name. Since, we know that every department might have some minor difference in the evaluation criterion, it would be much better if we can predict according to the branches in the institute. Secondly, we can make this model work in a website like environment, where people could use this prediction model easily.

REFERENCES

[1] Wikipedia contributors. History of education. Wikipedia, The Free Encyclopedia. December 24, 2020, 08:29 UTC. Available at: https://en.wikipedia.org/w/index.php?title=History_of_education&oldid=996057194. Accessed January 19, 2021.

[2] M. S. Acharya, A. Armaan and A. S. Antony, "A Comparison of Regression Models for Prediction of Graduate Admissions," 2019 International Conference on Computational Intelligence in Data Science (ICCIDS), Chennai, India, 2019, pp. 1-5, doi: 10.1109/ICCIDS.2019.8862140.

[3] H. A. Mengash, "Using Data Mining Techniques to Predict Student Performance to Support Decision Making in University Admission Systems," in IEEE Access, vol. 8, pp. 55462-55470, 2020, doi: 10.1109/ACCESS.2020.2981905.

[4] Dinesh Kumar B Vaghela, Priyanka Sharma, et al, "Students' Admission Prediction using GRBST with Distributed Data Mining", in Communications on Applied Electronics (CAE) – ISSN : 2394-4714, Volume 2 – No.1, June 2015 – www.caeaccess.org

[5] Anand V. Saurkar, Kedar G. Pathare, Shweta A. Gode, "An Overview On Web Scraping Techniques And Tools", April 18 Volume 4 Issue 4 , International Journal on Future Revolution in Computer Science & Communication Engineering (IJFRSCE), PP: 363 – 367

[6] V. Singrodia, A. Mitra and S. Paul, "A Review on Web Scrapping and its Applications," 2019 International Conference on Computer Communication and Informatics (ICCCI), Coimbatore, Tamil Nadu, India, 2019, pp. 1-6, doi: 10.1109/ICCCI.2019.8821809.

[7] Mohan S Acharya, "Graduate Admissions", Predicting admission from important paramaters, Kaggle, April 2018. Accessed on: Jan. 13, 2021.[Online].Available: https://www.kaggle.com/mohansacharya/datasets

[8] "A Tutorial on Multiple Linear Regression", Department of Statistics and Data Science, Yale University, Accessed on: Jan. 13, 2021. [Online]. Available: http://www.stat.yale.edu/Courses/1997-98/101/linmult.htm

[9] AnkanDas, "Python | Decision Tree Regression using sklearn", 4 Oct., 2018. Accessed on: Jan. 13, 2021. [Online]. Available: https://www.geeksforgeeks.org/python-decision-tree-regression-using-sklearn/

[10] Afroz Chakure, "Random Forest Regression", June 29, 2019. Accessed on: Jan. 13, 2021. [Online]. Available: https://medium.com/swlh/random-forest-and-its-implementation-71824ced454f

[11] Scikit-learn developers, "sklearn.preprocessing. StandardScaler", Scikit-learn, Accessed on: Jan. 13, 2021. [Online]. Available: https://scikit-learn.org/stable/modules/generated/sklearn.preprocessing.StandardScaler.html

[12] Songhao Wu, "3 Best metrics to evaluate Regression Model?", towardsdatascience, Accessed on: Feb. 01, 2021. [Online]. Available: https://towardsdatascience.com/what-are-the-best-metrics-to-evaluate-your-regression-model-418ca481755b.

This page is kept blank intentionally

Implementation of Network Based Intrusion Detection System using Machine Learning

Sanjana Singh
Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai,India
sanjanaa.singh1598@gmail.com

Rahul Varma
Electronic sand Telecommunication
Thakur College of Engineering and Technology Mumbai,India
rv111421@gmail.com

Prathamesh Tendulkar
Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai,India
pratexd007@gmail.com

Mr. Deepak S. Shete
Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai,India
deepak.shete@thakureducation.org

***Abstract*— The Internet environment is riddled with various network attacks. To detect malicious activity on a system or network, an Intrusion Detection System (IDS) is used. We use the Intrusion Detection System to scan illegal and illegal activities via a network or administrator. Security investigators use the IDS as a real-time scanner. A few decades ago a clear increase between computer connections, servers, systems and since then security has been a major issue for this network. IDS may be network-based or hosted as needed. Security plays an important role in solving business and personal problems. The Network Access Program will be a software application that will monitor the activities of the program or the network for unauthorized access to malicious devices and activities, which will alert the user according to statistical methods. The IDS will result in its operation where an attack or network intrusion may occur to ensure that IT staff are informed. The network acquisition system (NIDS) scans data that passes between applications within the network, as well as incoming and outgoing traffic over the network. NIDS monitors network traffic and triggers alerts for known threats and suspicious activity, so IT staff can monitor it closely and take appropriate steps to prevent or stop the attacks. This paper provides details on the system of access access and the possibility of access to the system.**

Keywords*— *IDS, Network attacks, Statistical methods, Suspicious activity, Machine Learning algorithms, Privacy,

I. INTRODUCTION

In this Project, we have introduced the idea of establishing an Intrusion Detection System (IDS). It is a program that checks network traffic for suspicious activity and issues warnings when that service is found [2]. It is a software application that scans the network or the program for malicious activity or policy violations [1]. A key benefit of an intrusion detection system is to ensure that IT staff are informed when an attack or network intrusion is possible. The network acquisition system (NIDS) monitors both incoming and outgoing traffic over the network, as well as the flow of data between programs within the network [3]. The network IDS network monitors network traffic and triggers alerts when suspicious activity or known threats are detected, so IT staff can monitor closely and takeappropriate action to prevent or stop an attack

The IDS is made up of the following three elements [3]:

1) Sensors: - which understands the network or function of the program and performs events.

2) Console: - event monitoring and alerts and sensor control,

3) Discovery Engine: - which records sensory events in the database and uses a set of rules to generate warnings from detected security events. There are many ways to differentiate IDS by type and location of sensors and processes used by the engine to generate warnings. In most simple IDS applications all three items are integrated into one device or object.

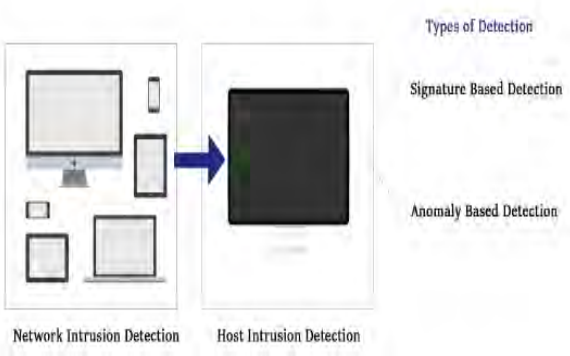


Fig. 1 – Types of Intrusion Detection

1) Based on signature: -

This type of IDS is based on the search for a "signature," pattern, or known identity, entry or specific entry event. Most IDs of this type. It requires regular updating of signatures or identity ownership at the moment to ensure that its login database is up-to-date. This means that the signature-based IDS is the same as its current data status. Attackers can circumvent the signature-based IDS by constantly changing the small details of how an attack occurs, so the information details cannot move. In addition, it means that a completely new type of attack cannot be taken at all with an IDS-based signature because the signature is not in the database. In addition, when the database becomes larger, the processed load exceeds the process

of analyzing each connection and looking at it compared to the database [4].

2) Anomaly-based: -

Anomaly-based intrusion detection systems are primarily introduced to detect unknown attacks, in part due to the rapid development of malware. The basic way is to use machine learning to build a reliable work model, and then compare the new behavior with this model. Since these types can be trained in terms of software and hardware optimization, the machine-based learning method has a standardized performance that is better compared to the traditional signature IDS. While this approach enables the detection of previously unknown attacks, it may suffer from false positives: previously unknown legal activities can also be classified as dangerous. Most existing IDs suffer from wasting time during the discovery process which reduces the effectiveness of IDS [3]. The algorithm for selecting an efficient feature makes the classification process used in the acquisition more reliable. The system should address a large amount of data, a hybrid multi-level model to improve accuracy. And by building a more efficient model based on well-designed classifiers able to differentiate new attacks with better performance. Network access can be improved using the latest data mining techniques such as deep neural network, dbscan [5]. Feature selection can only be used to select appropriate features. Using the feature selection time feature can be improved and the accuracy. The reduction in size using the main material analysis can be used to improve time and
vision. Further research into Dos, Probe, r2l, urr and immature datasets should contain a class attribute of the 24 types of attacks listed under 4 categories.

II. PROPOSED APPROACH

In order to enable the proposed model for a system with high penetration capabilities, it is very important to understand and develop the pillars of the model. The high accuracy and performance of the model will be a major factor in reducing the prices of positive false alarms. All of these goals can be achieved if data processing is combined with appropriate mathematical methods. It is also important to identify and extract the most relevant features that help to identify irregularities with minimal difficulty. Feature selection and output go a long way in making the acquisition model work better.

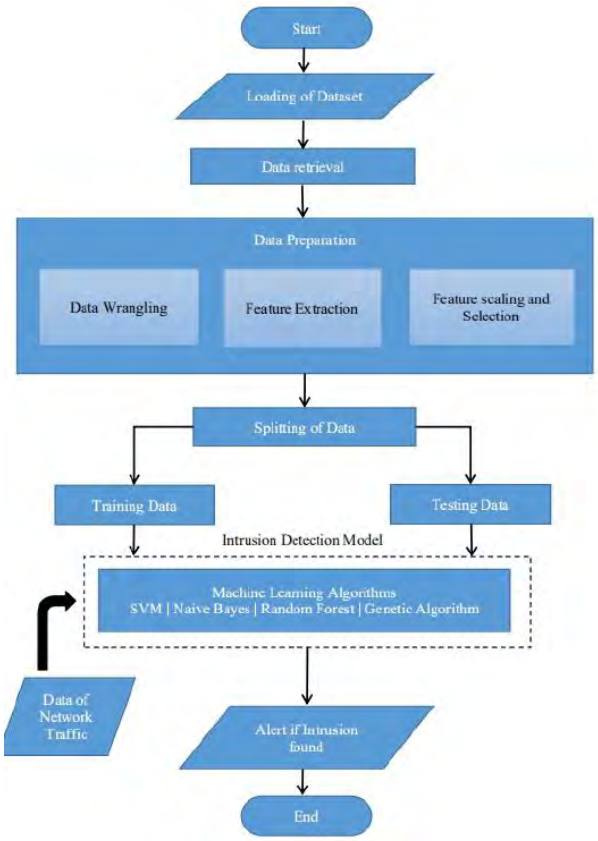


Fig. 2 - Flowchart of Intrusion Detection System

A. Data Collection

For Intrusion detection, the NSL-KDD dataset [1] was used with 41 traits in each training and testing database. The NSL-KDD database contains unwanted data and category features that need to be processed in advance. In the data set, it contains 24 and 38 types of attacks found in training and testing the database respectively.

B. Pre-Processing

Preliminary processing was done with the original NSL-KDD database required to perform it as a proper input into our algorithms. Data configuration settings are available using:
i. Data sets change
ii. Data sets standard

Data setup: NSL-KDD training database containing approximately 4 900,000 single connection cases. Each connection mode contains 42 elements including attack or normal. For this change, we will be using Table 2. Also, we must assign a number of numbers to the last element within the connection condition of the target section.

Data set normalization: Database configuration is considered necessary to improve the performance of an intrusion detection system when data sets are too large. Definition usage is a function that makes the values of each element data zero and the unit variance typical practice is referred to as the creation of variable and measured versions, where the objective is that the standard value allows comparisons of the corresponding values of different data sets in a way that eliminates all negative effects. Other forms of standardization include redemption only to arrive at prices related to variations in a particular size. In terms of measurement scales, such ratios make sense in measurement scales (where measurement scores are reasonable), not interval measurements (where only scales are reasonable, but not ratios) [4]. The database contains symbolic features; these factors cannot be processed separately. Therefore, preliminary processing is possible. At this stage all non-numerical or symbolic features are removed or replaced. Completion or replacement of non-numerical or symbolic features is done in the pre-processing phase. A thorough pre-processing process is essential, where non-numerical or symbolic features are removed or replaced, as they do not play an important role in gaining access. Symbol features such as protocol, service and flag are modified or removed. Finally, cases are labeled under four categories: Standard, DoS, Probe, and R2L.

C. Feature Selection

Features are very important in machine learning because they are the only measurable structures of the observed practice. Choosing informative and independent features is an important step. Feature selection or attribute selection is the process of selecting a subset of knowledgeable features from the whole set. Feature selection methods are used to identify contributing factors and remove unnecessary, unnecessary attributes from data that do not affect the accuracy of speculative models, whether installed or not, or which may actually reduce the accuracy of the model. Feature selection and feature removal are different. The main difference between feature selection and release is that feature selection attempts to find the best set of features between original features while feature removal creates a new set of features.

III. RESULT

Feature Selection of Attacks:

Features selected for DoS: ['src_bytes', 'dst_bytes', 'wrong_fragment', 'num_compromised', 'same_srv_rate', 'diff_srv_rate', 'dst_host_count', 'dst_host_same_srv_rate','dst_host_serror_rate', 'dst_host_srv_serror_rate','service_ecr_i', 'flag_RSTR', 'flag_S0']

Features selected for Probe: ['src_bytes', 'dst_bytes', 'rerror_rate','dst_host_same_srv_rate', 'dst_host_diff_srv_rate', 'dst_host_same_src_port_rate', 'dst_host_rerror_rate', 'service_finger', 'service_ftp_data', 'service_http', 'service_private', 'service_smtp', 'service_telnet']

Features selected for R2L: ['duration', 'src_bytes', 'dst_bytes', 'hot','num_failed_logins', 'num_access_files', 'dst_host_count', 'dst_host_srv_count', 'dst_host_same_srv_rate', 'dst_host_same_src_port_rate', 'dst_host_srv_diff_host_rate', 'service_ftp_data', 'service_imap4']

Features selected for U2R: ['duration', 'src_bytes', 'dst_bytes', 'hot', 'root_shell', 'num_file_creations', 'num_shells', 'srv_count', 'dst_host_count', 'dst_host_same_srv_rate', 'dst_host_srv_diff_host_rate', 'service_ftp_data', 'service_other']

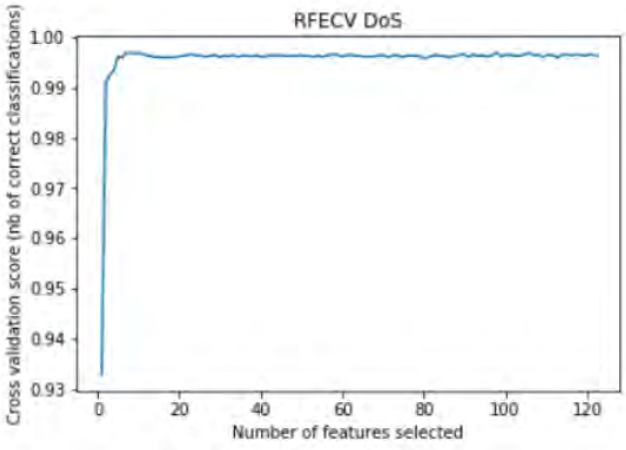


Fig. 3. Feature ranking with recursive feature elimination and cross validated selection of DoS

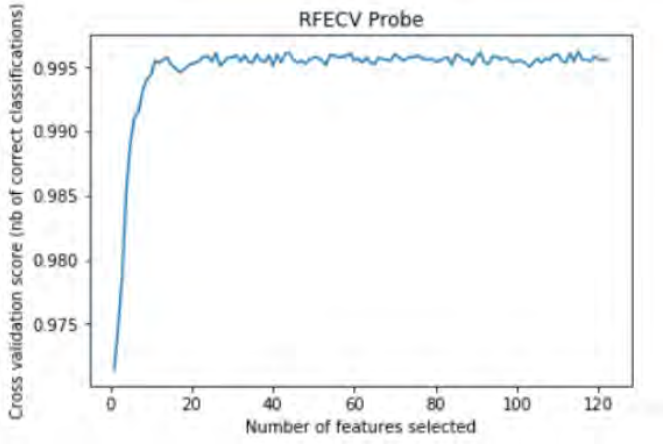


Fig. 4. Feature ranking with recursive feature elimination and cross validated selection of Probe

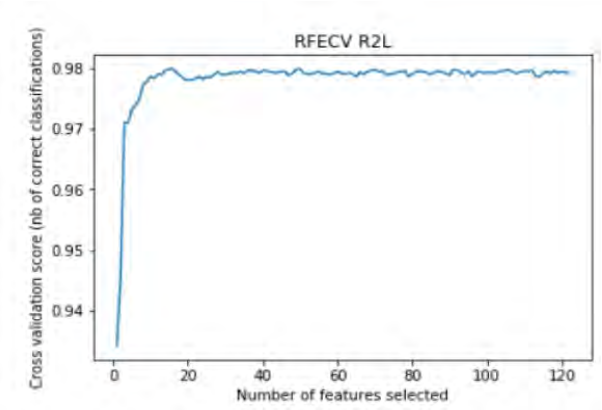


Fig. 5 Feature ranking with recursive feature elimination and cross validated selection of R2L

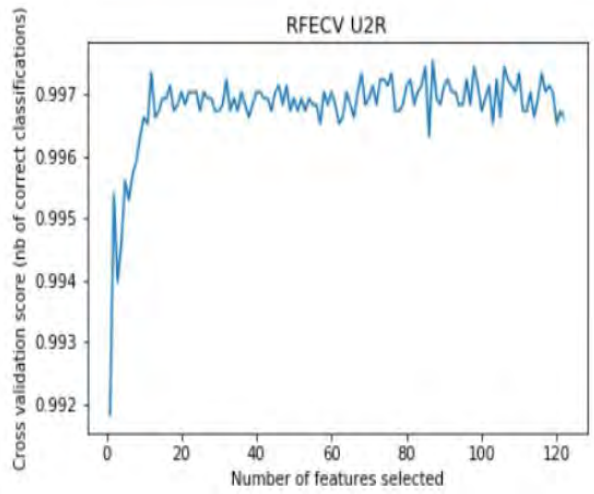


Fig. 6. Feature ranking with recursive feature elimination and cross validated selection of U2R

IV. CONCLUSION

Basic analysis and implementation of Intrusion acquisition using machine learning was done this semester by doing a preliminary consideration of easily accessible data set from UC Irvine University. Implementation of 4 attacks namely. Dos, Probe, User to Root, Remote to Local are made using python libraries such as Scikit learn (algorithms), Pandas (data analysis), Numpy (mass component), Matplotlib (image representation).

V. FUTURE SCOPE

Future work works with a large amount of data, a hybrid multilevel model will be developed to improve accuracy. It works by building a model that works best based on well-designed classifiers that are able to differentiate new attacks with better performance. Interference detection and entry restriction are required for current trends. Third-party scanner software will be used to scan the network in real time and retrieve data in its own way and convert the data into a database by converting the data into a csv or excel file and inserting the data into the model.

REFERENCES

[1] Anish Halimaa A, Dr. K.Sundarakantham "Machine Learning Based Intrusion Detection System" Proceedings of the Third International Conference on Trends in Electronics and Informatics (ICOEI 2019).

[2] Ripon Patgiri, Udit Varshney, Tanya Akutota, and Rakesh Kunde "An Investigation on Intrusion Detection System Using Machine Learning" IEEE Symposium Series on Computational Intelligence SSCI 2018.

[3] Dikshant Gupta, Suhani Singhal, Shamita Malik, Archana Singh "Network Intrusion Detection System Using various data mining techniques" International Conference on Research Advances in Integrated Navigation Systems (RAINS - 2016), April 06-07, 2016, R. L. Jalappa Institute of Technology, Doddaballapur, Bangalore, India.

[4] Salah Eddine Benaicha, Lalia Saoudi, Salah Eddine Bouhouita Guermeche, Ouarda Lounis "Intrusion Detection System Using Genetic Algorithm" Science and Information Conference 2014 August 27-29, 2014.

[5] Alaa Abd Ali Hadi "Performance Analysis of Big Data Intrusion Detection System over Random Forest Algorithm" International Journal of Applied Engineering Research ISSN 0973-4562 Volume 13, Number 2 (2018) pp. 1520-1527.

[6] H. Wang, J. Gu, and S. Wang, 'An effective intrusion detection framework based on SVM with feature augmentation,'' Knowl.-Based Syst., vol. 136, pp. 130–139, Nov. 2017.

[7] Setareh Roshan, Yoan Miche, Anton Akusok, Amaury Lendasse; "Adaptive and Online Network Intrusion Detection System using Clustering and Extreme Learning Machines", ELSEVIER, Journal of the Franklin Institute, Volume.355, Issue 4,March 2018,pp.1752-1779.

[8] Huang, G.-B., Zhou, H., Ding, X., & Zhang, R "Extreme learning machine for regression and multiclass classification. IEEE Transactions on Systems, Man, and Cybernetics" 42(2), 513–529, 2012.

Automatic Toll Collection System using Image Processing

Abhishek Sukla
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
abhi128@gmail.com

Riya Singh
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
riya301199@gmail.com

Pooja Yadav
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
pooja.yadav2250@gmail.com

Abstract*—For heavy traffic highway roads, particularly in India delay at the toll booths is common scenario. There is a need of an intelligent system that will recognize the vehicle number plate which reduces the amount of time and efforts. Proposed system of toll automation technique using ANPR is designed to ensure a steady flow of traffic. Automatic Number Plate Recognition (ANPR) algorithm-based system proposes a methodology in which every vehicle owner will yearly deposit the toll tax in government account if these vehicles are passing through the toll gates equipped with digital camera capturing image of vehicle number plate. Captured images then get processed with Proposed ANPR algorithm. The ANPR algorithm works on steps like extraction of numbers pre-processing via filtering, segmentation and character recognition. Central database is used to store the user's vehicle information. If user is registered account holder, then toll gate will be opened and vehicle is passed from toll plaza. The user will be informed about the toll deduction and his account status through the SMS. The performance of algorithm is checked on real images with parameters like success rate, illumination conditions, and tilted position of number plates. Further this system can be utilized for investigation of stolen vehicles.

Keywords -ANPR, Extraction, Segmentation, Optical Character Recognition, GSM.

INTRODUCTION

ANPR is an image processing based automatic number plate recognition system used to identify vehicles by only their license numbers on plate. It is automatic toll collection system and free from human interference. The ANPR system consists of the following three steps: Extraction of plate region, character segmentation, and character recognition. ANPR system is used for automatic toll collection at toll booth, automatic ticketing of vehicles at parking area, border control, detection of stolen car, access control in building area, intelligent traffic system and effective control purpose. The main aim of the system is to replace the manual systems with an automated system with proper identification and localization of the number plate information.

I. LITERATURE SURVEY

"Vehicle Counting and Automated Toll Collection " System using Image Processing", Swati Sagar, Jayshree Jori, Aishwarya Kale, Kalyani Khodade, Payal Mali, Vol. 2, April 2016.In this paper they'd have developed a project to collect tolls using image processing. Here it uses OCR (optical character recognition) on the image taken by the camera. There are three primary algorithm they've used namely as follows: Plate localization: It is responsible for isolating a plate from the image. Optical Segmentation: It is used to find the individual characters on the plate.OCR: The characters are recognised by using template matching. Processing, multi-style plate recognition, and multi-plates processing at a time, video based ANPR using temporal information and recognition of ambiguous characters and so on.

"Automatic Vehicle Number Plate Recognition System using MATLAB", Bhawna Tiwari, Archana Sharma, Malti Gautam Singh, Bhawana Rathi, July 2016.In this paper they have used MATLAB to collect tolls using Image processing. They've also used morphological based number plate detection such as: Erosion: which is used to remove unnecessary objects. Dilation: which is used to fill small holes in images. They've also used various operations on image to make it look clearer.

Marcin IWANOWSKI.
"Automatic car number plate detection using morphological image processing." the author described that the image is taken by the camera, there are different methods and function for text extraction. Text extraction means to extract the text from an image. The text is in the form of structured or unstructured. Before the extraction of text noise needs to remove from the image. Median filter is used to remove the noise. This is used because it is good in removing noise from any of the image. Morphological algorithm basically used to detect the structure taken. Basically, use to detect and then to modify it into proper form.

II. PROPOSED DESIGN

The proposed algorithm of automatic number plate recognition is divided into following steps: (a) taking picture from the vehicle, (b) processing the image, (c) character extraction from the number plate, (d) character segmentation, (e) character matching, (f) identify the number plate, (g) output. The typical flow diagram of the system is shown in Figure 1

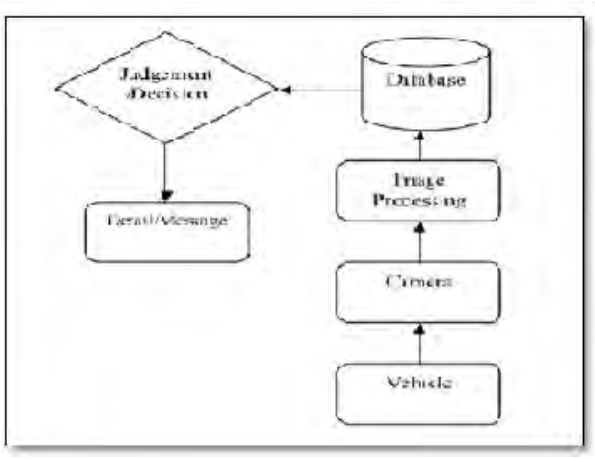


Figure 1. Basic block diagram of ANPR

In the proposed system, a camera is installed for collecting an image. An automatic method is followed for analysis and recognizes the number plate within an estimated time under existing illumination condition. By comparing with the database, a decision and output is displayed accordingly. It performs the two major task:

(a) Number plate number location using canny detector

(b) Recognition of number plate with template matching to identify each and every character (A to Z), numerical value (0 to 9) and making a separate sign ('-').

When all these tasks are completed successfully then it is matched with the database information stored [4].

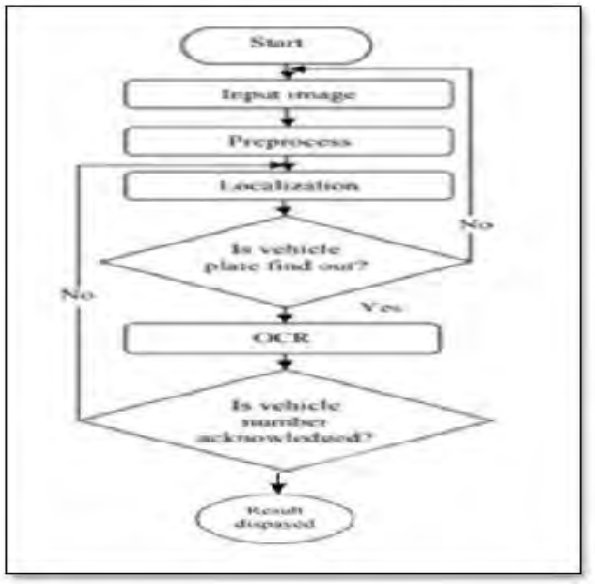


Figure 2: Algorithm Design of ANPR

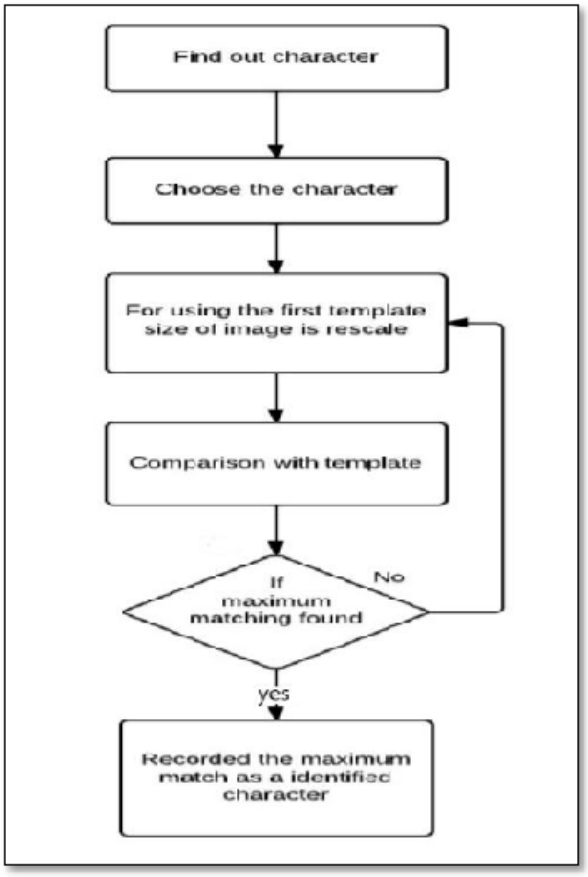


Figure 3: Flow Chart for Template Comparison

III. CONCLUSION

This ANPR system is best method for toll fee collection which can save time and human efforts. It gives accurate result as compare to RFID tag method of toll collection. Our ANPR system works for a specific plate formats such as white background and black font on it which is standard format for number plate. The system used GSM for sending the customer's details on mobile and amount deduction is done if customer is authorized person otherwise toll gate will not be open and next verification will be start. Hence the system is able to save time. Finally, advantage is that stolen vehicle or unauthorized person is unable to cross the toll gate.

IV. REFERENCES

[1] "Vehicle Counting and Automated Toll Collection" System using Image Processing", Swati Sagar, Jayshree Jori, Aishwarya Kale, Kalyani Khodade, Payal Mali, Vol. 2, April 2016.

[2] "Automatic Vehicle Number Plate Recognition System using MATLAB", Bhawna Tiwari, Archana Sharma, Malti Gautam Singh, Bhawana Rathi, July 2016.

[3] Image Processing Based Toll Automation Technique Using ANPR Dr. P. B. Mane, Gayatri Bade, Varsha Patil, July 2019.

[4] Automated Toll System for Number Plate Detection and Collection. Rama Takbhate, Prof. S. D. Chavan, July 2014

[5] Automated Toll System for Number Plate Detection and Collection: AnkitaBhore, Bhawananimbhorkar, PunamPure, Priya Thombre, October 2016

Loan Approval System using Big Data and Machine Learning

Ankit Dubey
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai – 400101
1032170443@tcetmumbai.in

Ashutosh Dubey
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
1032170445@tcetmumbai.in

Ravi Mishra
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai - 400 101
1032170487@tcetmumbai.in

***Abstract*— With the enhancement in the banking sector lot of people are applying for bank loans but the bank has its limited assets which it has to grant to limited people only. So finding out to whom the loan should be granted which will be a safer option for the bank is a typical process. So in this work we try to reduce this risk factor behind selecting the safe person so as to save lot of bank effort and assets. This is done by mining the Big Data of the previous records of the people to whom the loan was granted before and on the basis of these records/experiences the machine is trained using the machine learning model which gives the most accurate result. The main objective of this work is to predict whether loan will be assigned to a particular person or not. A bank's profit or a loss depends to a large extent on loans, that is whether the customers are paying back the loan or defaulting. By predicting the loan defaulters, the bank can reduce its Non- Performing Assets. This makes the study of this phenomenon very important. Previous research in this era has shown that there are so many methods to study the problem of controlling loan default but as the right predictions are very important for the maximization of profits, it is essential to study the nature of the different methods and their comparison.**

Keywords—Banking sector, Big Data, Data analysis, Loan approval, Machine learning, Prediction

I. INTRODUCTION

Loan Prediction is very helpful for employee of banks as well as for the applicant also. The aim of this work is to provide quick, immediate and easy way to choose the deserving applicants. It can provide special advantages to the bank. The Loan approval System can automatically calculate the weight of each features taking part in loan processing and on new test data same features are processed with respect to their associated weight .A time limit can be set for the applicant to check whether his/her loan can be sanctioned or not. Loan Prediction System allows jumping to specific application so that it can be check on priority basis. The term banking can be defined as receiving and protecting money that is deposited by the individual or the entities. This also includes lending money to the people which will be repaid within the given time. Banking sector is regulated in most of the countries as it is the important factor in determining the financial stability of the country. The provision of banking regulation act allows public to obtain loans. The purpose of the loan can be anything based on the customer requirements. Loans are broadly divided as open-ended and close-ended loans. Open-ended loans are the loans for which the client has approval for a specific amount. Examples of open-end loans are credit cards and a home equity line of credit (HELOC). Close-ended loans decreases with each payment. In other words, it is a legal term that cannot be modified by the borrower. Personal loans, mortgages, auto payments, installment loan and student loans are the most common examples of close-ended loans. Secured or collateral loan are those loans that are protected by an asset. Houses, Vehicles, Savings accounts are the personal properties used to secure the loan.

This work is exclusively for the managing authority of Bank/finance company, whole process of prediction is done privately no stakeholders would be able to alter the processing. Result against particular Loan Id can be send to various departments of banks so that they can take appropriate action on application. This helps all others department to carried out other formalities.

The rest of the paper is organized as follows, Section II contains literature survey of related work. Section III describes the Proposed Model. Section IV and V contains Results and Conclusion respectively

II. LITERATURE SURVEY

Aditi Kacheria, Nidhi Shivakumar, Archana Gupta and Shreya Sawker [⅔1], proposed a model for the loan approval authorities which would help them judge the credibility of customers who have applied for the loan, hence increasing the chances of their loans being paid back in time. Their model comprises of three components: a) Pre-processing-which is done using K-NN and Binning. b) Classification - Naïve Bayes algorithm is used to decide whether to sanction loan to a customer. c) Database Updation: The newly found data is added for further results.

Aboobyda Jafar Hamid along with Tarig Mohammed Ahmed proposed a solution, to yield a decision whether to grant a loan to a client [2]. Three different models based on three classification algorithms were constructed. These algorithms are bayesNet, j48, and naiveBayes which were implemented using WEKA.

Based on the results of these classification algorithms, J48 algorithm was concluded to be the finest because it produces low mean absolute error and high accuracy.
Vimala and Sharmili [2] proposed a loan prediction model using NB and Support Vector Machines (SVM) methods. Naïve Bayes, an independent speculation approach, encompasses probability theory regarding the data classification. On the other hand, SVM uses statistical learning model for classification of predictions. Dataset from UCI repository with 21 attributes was adopted to evaluate the proposed method. Experimentations concluded that, rather than individual performances of classifiers (NB and SVM), the integration of NB and SVM resulted in an efficient classification of loan predictions.

III. PROPOSED MODEL

Logistic regression model:-
We have the loan application information like the applicant's name, personal details, financial information and requested loan amount and related details and the outcome (whether the application was approved or rejected). Based on this we are going to train a model and predict if a loan will get approved or not. We are using pandas to load the data. We will also use pandas next to explore the data both with descriptive statistics and data visualization

Fig.1.

sklearn requires all inputs to be numeric, we should convert all our categorical variables into numeric by encoding the categories.
Splitting the dataset:-Training dataset.
Testing dataset.
Evaluating the model and training the Model:-Logistic Regression : Logistic Regression is a classification algorithm. It is used to predict a binary outcome (1 / 0, Yes / No, True / False) given a set of independent variables.

IV. RESULT AND DISCUSSION

The model is giving us perfect score on accuracy but a low score in cross validation, thus a good example of over fitting. The model is having a hard time at generalizing since it's fitting perfectly to the train set.
Solutions to this include: Reducing the number of predictors or tuning the model parameters.

V. CONCLUSION

From a proper analysis of positive points and constraints on the component, it can be safely concluded that the product is a highly efficient component. This application is working properly and meeting to all Banker requirements. This component can be easily plugged in many other systems. There have been numbers cases of computer glitches, errors in content and most important weight of features is fixed in automated prediction system, So in the near future the so –called software could be made more secure, reliable and dynamic weight adjustment .In near future this module of prediction can be integrate with the module of automated processing system. The system is trained on old training dataset in future software can be made such that new testing date should also take part in training data after some fix time.

REFERENCES

[1] Aditi Kacheria, Nidhi Shivakumar, Shreya Sawkar, Archana Gupta, ― Loan Sanctioning Prediction System‖, International Journal of Soft Computing and Engineering (IJSCE), vol. 6, no. 4, pp. 50-53, 2016.
[2] Aboobyda Jafar Hamid and Tarig Mohammed Ahmed, Developing Prediction Model of Loan Risk in Banks using Data Mining‖, Machine Learning and Applications: An International Journal (MLAIJ), Vol.3, No.1, pp. 1-9, March 2016.
[3] S. Vimala, K.C. Sharmili, Prediction of Loan Risk using NB and Support Vector Machine‖, International Conference on Advancements in Computing Technologies (ICACT 2018), vol. 4, no. 2, pp. 110-113, 2018.

Visioning of Deep Learning in Future

Maryam Rasoolzadeh
Department of Chemistry, Islamic
Azad University, North Tehran
Branch, Tehran, Iran
Rasoolzadeh21@gmail.com

***Abstract*— The manuscript is to outline the visioning of the deep learning, while highlighting its role in the future chemistry. The introduction of the literature shows benefits and drawbacks of current trends and attitudes in the field of chemistry which is to highlight the role of AI (artificial intelligence). The conceptual framework of the research emphasizes on the key elements of deep learning such as data, model and prediction space. The results of the critical review on the leading literature highlight meaningful steps toward the case such as transfer learning, multitask learning, one shot learning, Zero-shot learning, autoencoders, generative adversarial networks (GANs), data augmentation, reinforcement learning, supervised learning and unsupervised learning. The deep learning applications in chemistry might be understood in recognizing molecules, designing molecules, synthesizing molecules and reaction prediction. The review emphasize on the significance of understanding the "future perspective" in order to meet efficient planning and programming in the case of the visioning of the deep learning in the future chemistry.**

Keywords—Artificial intelligence, Deep learning, Computational chemistry, Designing molecules, Synthesizing molecules.

I. INTRODUCTION

Deep learning has emerged as a dominant force within machine learning over the last decade through a series of demonstrations of its frequently superhuman predictive power. These primary demonstrations have developed a desire among investigators to harness its abilities to manage challenges in an exceedingly various range of fields. Chemistry is one of these fields, with a range of complicated subjects like reaction optimization, retrosynthesis, and drug design. The manuscript aims to investigate the visioning of the deep learning in the future chemistry comprehensively, in order to outline a general overview. The main idea of this research came from the brilliant research of Adam C. Mater and Michelle L. Coote namely "Deep Learning in Chemistry" [1] in which the influence of the deep learning in the chemistry is discussed. The research is to develop the idea in the form of critical review. A wider view to the case of the deep learning and its role is transforming the contemporary chemistry. It might be highlighted that the deep learning has a lot to do with future chemistry, more than its role in outlining role in contemporary chemistry. It is to transform the future path and to develop a more accurate methodology based on AI.

II. CONCEPTUAL FRAMEWORK

Machine learning is the study of computer algorithms that improve automatically through experience. It is seen as a subset of artificial intelligence. The goal of Machine learning is to solve the problem of computers learning from data. Representation learning is a subset of machine learning and is a set of techniques that allows a system to automatically discover the representations needed for feature detection or classification from raw data. This replaces manual feature engineering and allows a machine to both learn the features and use them to perform a specific task. Eventually, deep learning is part of machine learning methods based on artificial neural networks with representation learning in which multiple layers of internal representations, initially of simple shapes such as edges, are combined to form increasingly complex objects, like faces. Learning can be supervised, semi-supervised or unsupervised. It can be said that deep learning algorithms will be a valuable tool for computational chemistry and cheminformatics, from computer-aided drug design to materials property prediction.

Understanding how these questions are being answered needs an introduction to the methods of deep learning.

Machine learning, and thus deep learning, at its core includes three parts: the data (and its related presentation), the model that will learn to explain the data, and a prediction space (fig1). The model in deep learning demonstrates an optimization cycle of three subparts: the learner, assessment, and optimization [2].

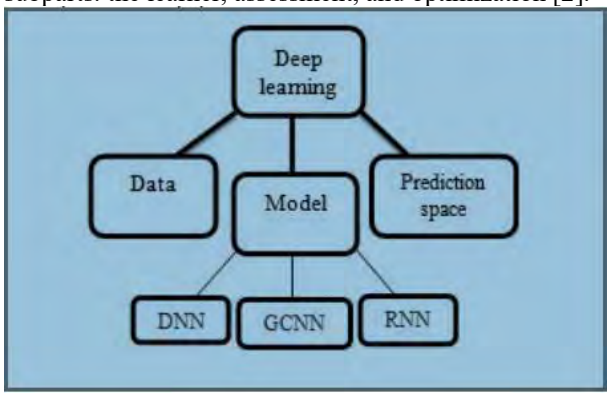


Figure 1- main components of deep learning

The Learning process requires "data" and in the supervised learning, this data must be labeled. These labels displays the Maryam Rasoolzadeh Department of Chemistry, Islamic Azad University, North Tehran Branch, Tehran, Iran Rasoolzadeh21@gmail.com

ground truth associated with the data point, like associating a label of "cat" with a picture of a cat. In chemistry, the data can be a presentation of a molecule with its one property labeled such as Gibbs free energy. One of the main challenges in deep learning is that how adequate data can is get?

The most dominant representations of deep learning's potential are in areas where data is plenty, usually where millions of data points can be getting through distributed set via Internet. In a chemical sense, all levels of data are available; with vast data exist for prosperous reactions or ground state energies. As a result of this need for data, chemical deep learning has constructed a powerful link with computational chemistry due to the latter's capacity to produce massive number of data considerably faster than it could be get in a laboratory. Molecules must be storage into data collections in order to be transformed into a model input. To digitize the tremendous number of structures in the text, deep learning has been applied to automate the digitization of these structures. SMILES (The Simplified Molecular Input Line Entry System) is a classic cheminformatics representation that employs a collection of ordered principles and specialized syntax to encode three-dimensional chemical structures as strings of text. A reaction variant of SMILES, which includes specialized grammar to explain chemical transformations, is also mostly employed in machine learning for models that operate on reaction data sets.

The "model" is the part that converts the data into a prediction, action or classification. The model based on interaction between its learner, assessment, and optimization. The learner includes a collection of factors which describe how each input point is transformed into an output. This anticipation is then quantitatively compared to the favorable output by an evaluation or cost function. Eventually, optimization changes the factors of the model to decline the difference between the predicted and the favorable output for every data point. Therefore, it can be said this cycle of the model making anticipations, then evaluated and eventually employed to optimize the model's factors. In deep learning the learner is defining feature of deep learning procedures, with a connection being formed with the field of connectionism. Connectionism is relied on the development of artificial neural networks (ANNs) and their plenty alternatives. Due to their importance in deep learning procedures, the rest of the model debate centralizes on variants of ANNs. Despite the massive variety in the learner architecture, there are a few methods to assessment and optimization. In the case of neural networks, the assessment stage is usually a simple function that evaluates the learner's efficiency among the data; two general instances are the root means squared deviation or the cross entropy cost function.

Three of the dominant neural networks are Deep Neural Network (DNN), Graph Convolutional Neural Network (GCNN) and Recurrent Neural Networks (RNNs).

DNN is the simplest deep learning structure and includes input, hidden, and output layers. Each layer contains of a collection of neurons, and in fully connected systems, every hidden layer neuron links to all neurons in the prior and subsequent layers. DNNs have been helpful at addressing chemical problems, but two other deep learning structures, computer vision and natural language processing, are more efficient.

The goal of computer vision is to usage computers to see in a way like to humans. Convolutional neural networks (CNNs) are networks specialized for dealing with grid-like data, such as a 2D image. Chemists mostly have focused on the graph convolutional neural network (DCNN) on molecular graphs. Recently, an immense diversity of molecular graph implementations has been investigated. [3-5]

This method uses a convolutional layer, simply a matrix of scalar weights, to interchange data between atoms or bonds in a molecule and generate a fixed length, real-valued vector that incorporates the molecular information.

Recurrent neural networks (RNNs) are specialized for interacting with sequences of arbitrary length. This develops them preferably suitable to managing textual representation of chemical data, like SMILES. The main difference between GCNN and RNN is that in the prior network every data input is distinguished, while in an RNN every input will affect the next one.

The prediction space is the collection of all attainable outputs for the network. In other words it can be thought of as the utility of the network or the question that the network can generate an output for.

A summary explanation of usually employed terms and example of its application in chemistry is listed. :

1. One Shot learning: an approach employed to overcome applications with extremely limited data that utilizes networks to compress inputs into a continuous latent space and then compares the representation in this space to a larger, trained latent space. It has been usage in chemistry for drug discovery by low-data [6, 7].
2. Zero-shot learning: In machine learning, Zero-shot learning (ZSL) is a problem setup while at test step, a learner recognizes objects from classes not previously seen at training stage [8, 9].
3. Multitask learning: This implicates training a model on multiple prediction tasks at the same time to decrease the likelihood of overfitting. It has been used to increase predictive performance for toxicity or bioactivity prediction.
4. Transfer Learning: Transfer learning includes using a network that has been trained on an associated work and then changing its parameters to suit to a new work, mostly with minor data. It has been employed to adapt a model trained on DFT to a smaller database of higher fidelity calculations by Smith et al [10].
5. Autoencoders: Network structure applied to compact an input to a real valued vector,

generally referred to as the latent space. A decoder network then takes this vector as its input and tries to regenerate the original input data. It has been employed to design molecules by training the latent space to reflect a specific property and then navigating it.

6. Generative Adversarial Networks (GANs): GANs use two networks in a competitive plan. One network has to produce data, and another has to characterize if a special data point is a fake generated by the network or a real one from the data set. By competing with one another, the generating network learns to make high quality imitations of the data set. It has been used for the inverse molecular design question.
7. Data Augmentation: This includes expanding a data set by making new training examples through reasonable manipulations of the data. One of the simplest displays of this is rotating images in a data set but keeping the same label in a method that is clear to humans; i.e., a book is still a book at various angles. This has been utilized with SMILES to evaluate the different potential orderings and enhancement the predictive performance.
8. Reinforcement Learning: This is when the model learns iteratively through trial and error by creating its cost function measure its progress toward a specific aim. It has been employed to train a model to optimize reactions.
9. Supervised Learning: In supervised learning, the training data consist of sets of input and associated output values. The aim of the algorithm is to derive a function that, given a specific set of input values, predicts the output values to an acceptable degree of fidelity.
10. Unsupervised Learning: Unsupervised learning is learning in which the looks for previously undetected patterns in a data set with no pre-existing labels and with a minimum of human supervision. DHT11 sensor works on serial communication.

III. DEEP LEARNING APPLICATIONS

Many problems by artificial intelligence and deep learning have been solved, and interesting results were obtained. This part reviews the several fields of chemistry that deep learning has thus far affected, presenting examples in each that illustrate outstanding achievements. Deep learning could find potential applications in any field of chemistry and related sciences. Deep learning has facilitated to create a molecule with a specific property in three main steps: recognizing molecules, designing molecules and synthesizing molecules. These areas are developing. Because of the main task of chemists is to make compounds with desired properties, the primary fundamental task in chemistry is to make inferences on which structure would have the desired property. The major role herein is the establishment of a relationship between a chemical structure and its activity and the prediction of properties. visiting a Textile Industry, we gathered the range of the parameters which will help with our project.

Deep learning and recognizing molecules

Computational modeling in chemistry searches to apply physics-based calculations to specify the properties and treatment of a special molecular system. There are two distinguished approaches which deep learning can be employed in this space. The first way is to integrate the deep learning approach with physics style methods to reduce computational barriers. The second way is straightly predicting properties from molecular structures, so bypassing physical rules altogether. Integrating deep learning procedures with physics-based methods involves training the network to anticipate a key part of the overall calculation. These contains applying the deep learning model to anticipate potential energy surfaces, force fields, add corrections to ab initio calculations, and to bypass expensive steps in both density functional and wave functional approaches. This method has some advantages such as flexibility and several disadvantages [11].

The replacement way to deep learning in computational chemistry is training a straight map from a simple representation of the molecule through to the desirable property. This is a various area of investigation that can broadly be captured under the two fields of quantitative structure property relationship (QSPR) and quantitative structure activity relationships relationships (QSAR). QSPR search to predict properties of molecular systems, whereas QSAR look for predict the activity of that molecule in a larger conditions, like toxicity in biological systems. The aim of these approaches is to maximize accuracy of anticipation. The properties that can be predicted are totally specified by the available training data, and there are many databases exist [12]. Generally for properties that can be easily computed, computational data sets are the common and computed with a DFT procedure. Properties that are hard or currently not possible to calculate accurately employed data sets contain

ChEMBL and PubChem. For this type of questions, DNNs were the most applicable network structure. They have been employed to successfully predict toxicity and bioactivity as well as other physical properties. Multitask networks are also mostly utilized due to the enhancement in predictive performance. RNNs have been more widely employed as the generative networks that generate new molecules. For predictive purposes, however, they have used both graph type input architectures the same as GCNNs to predict aqueous solubility and drug toxicities as well as the more traditional text-based inputs of SMILES for general property prediction.

In almost all cases, GCNNs and their many derived forms have clearly better predictive performance than either of the other two categories of approaches. Because of the focus on improving and developing network structure, convolutional models are mostly

tested against a diversity of benchmarks. However, there has been a special push to improve the predictions of electronic properties in order to ease the computational stress imparted by physics-based calculations. In addition to this, GCNNs have shown influence in predicting bioactivity, polymer property predictions, and physical properties. Work to increase their predictive abilities is ongoing, but errors below 1 kcal/mol are routinely achieved. The accuracy of these approaches brings into problem the validity of the training data, specially the accuracy of the labels, as well as potential bias in the data. DFT is known to have large errors, while the gold standard methods such as coupled cluster with singles, doubles, and perturbative triples (CCSD(T)) are currently prohibitively expensive for data sets of this size. In order to overcome this shortage, transfer learning has been used to fine-tune these networks on smaller data sets of calculations performed at obviously higher levels of theory, like CCSD(T) [1].

Regardless of the way of deep learning affects chemical property mappings, effective study of chemical space involves navigating not only the species space but also the conformational space of those species. Conformational screening is one of the main challenges in chemistry, as with every new atom, multiple additional local minima seem on the potential energy surface. The aforementioned neural network potentials show a fast method to study the conformational space of a molecule

Deep learning and Designing Molecules

Molecular design often referred to as inverse QSPR, has a history of machine learning applications containing Bayesian optimization and genetic algorithms. In last decade has seen the use of generative deep learning models to design molecules. This field can be concluded to recognize candidate molecules that improve the property. There are many methods that also utilize autoencoders, generative adversarial networks (GANs), or reinforcement learning agents to navigate chemical space structured around a specific property. Eventually, RNNs have also been employed for molecular library production by an adaptation of their text generation capabilities [1]. Two important and challenging categories of molecules including materials and drugs deserve specific attention. So they have motivated considerable investigation efforts with deep learning. Many new technologies like batteries, aerospace, catalysis and renewable energy focus on advanced materials. Recently deep learning represents its performance in this field and has been a fast growth in applications in the past few years [13]. GCNNs have been used to predict the properties of bulk materials, predict thermoelectric properties optimize polymer properties, and seek chemical materials space. These applications are still young. Extending this work beyond using neural network potentials will likely need enhancement data gathering efforts, as well as the development of newer descriptors to explain interacting, multi molecular systems. The generative models in drug design pursue the same trends as general molecular design, with autoencoders, GANs, and reinforcement learning all being utilized to try and produce potent drug molecules. In addition to these, there are several new ways to drug development. The most important limitation in drug design is the availability of limited data. Work by Altae-Tran et al employed one shot learning to show this deficit and make informed predictions about drug candidates with limited data [7]. Eventually, while not a molecule-optimizing generative system, work by Segler et al improved approaches to develop focused libraries of drug candidates for screening using RNNs [14].

Deep learning and synthesizing Molecules

Synthesis planning is often referred to as an art. The process of identifying a suitable pathway which transforms some set of available reactants into a target compound is typically performed by expert chemists with years or decades of experience. Organic chemists were amongst the first scientists to recognize the potential of computational methods in laboratory practice. To assist chemists with this task, computer-aided synthesis design was introduced over 40 years ago in the form of retrosynthetic planning software. Synthesis planning can be simplified into three parts: retrosynthesis, reaction prediction and reaction optimization.

Retrosynthesis was originally formalized by Corey and Wipke in their efforts to introduce computer assistance to synthesis with Logic and Heuristics Applied to Synthetic Analysis (LHASA). Recursively applying retrosynthetic templates to a target molecule produces a candidate synthesis tree [15, 16]. Computational retrosynthesis is making great steps; but, many problems remain unresolved. First, planning a retrosynthesis that looks valid and experimentally verifying its predictions are various challenges, and until these ways are precisely tested, it is not clear whether they are useful for chemists.

Computer-assisted synthesis planning tools commonly include five major components [15]:

1. A template library including the principles by which disconnections are proposed.
2. A recursive template application engine that produces candidate reactants for target product molecules.
3. A database including compounds that do not require to be expanded retro synthetically (e.g., are commercially available).
4. A strategy to guide the retrosynthetic search toward chemicals in that database.
5. A procedure for single-step or pathway-level scoring, for example, a preference for fewer synthetic stages

for example, a preference for fewer synthetic stages.

These challenges are beginning to improve with an example being the ASKCOS software extended by the Machine Learning for Pharmaceutical Discovery and Synthesis Consortium [17].

Reaction prediction is the process of taking a collection of studied reagents and conditions and predicting what products will form; as such, it

typically needs greater detection into uncharted chemical space. Current procedures to accomplish this, like quantum calculations, are extremely expensive and so limited to smaller molecules. Deep learning procedures

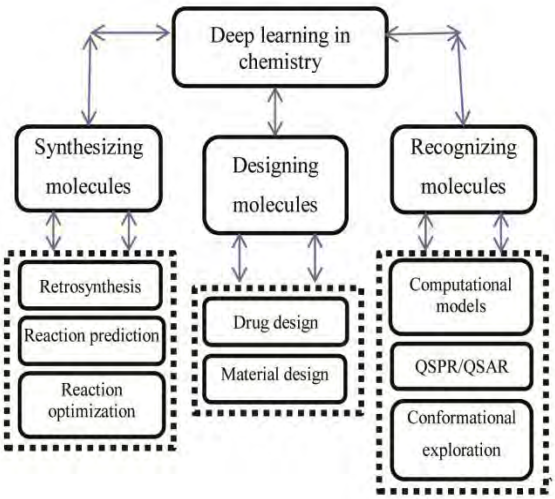


Figure 2- applications of deep learning in chemistry

illustrate a chance to decrease this computational cost and free up time of trained computational chemists.

One of the early works that applied deep learning to reaction prediction involved DNNs with molecular fingerprints to predict what generate would form.

Reaction optimization includes tuning the conditions of a reaction to enhancement its performance. Deep learning has the potential to do this. The potential of this approach was indicated by Zhou et al.in which an RNN variant learned to optimize the conditions of reactions.

IV. FUTURE PERSPECTIVE

The critical review toward the literature highlights the significance of futuristic perspective rather than nostalgia. Deep learning is a subfield of machine learning that employed sequential layers to extract higher level features and utilize them to learn the patterns present in a data set to predict future behaviour. Supervised learning needs huge volumes of labelled data and a quantitatively assessable question or purpose. With this, a model uses an interplay of a predictive learner, investigation, and optimization, in the form of a training cycle to iteratively improve and develop its performance till it begins to over fit the training set, at which point training stops and the model is evaluated. Artificial intelligence is offering alternatives and solutions that catalyse the creation and implementation of applications that would have been unconceivable or even impossible only 10 years ago. For this reason, many novel chemical industries, research projects, and ideas can greatly benefit from the inclusion of artificial intelligence, setting new frontiers while reaching a modernized and intelligent field of chemistry.

Growth of these approaches and their application has been outstanding in recent years. As demonstrated within this article, deep learning has and will continue to impact every step of the idealized chemistry, in other word, can be turn on the chemistry engine. The main challenges that must be considered to maximize the potential of this approach in chemistry are obtaining huge amounts of high-quality data, and effectively integrating with the larger chemistry community. AI technologies should be studied by all chemists, along with quantum chemistry and molecular modeling.

The first challenge will be improved by increased collaboration and continued open sourcing. The push for open sourcing has maximized, and there is strong evidence of it occurring in deep learning specially through software packages such as DeepChem, TensorMol, ANI, SchNetPack, and chemprop. Illustrating the problem of high-quality data also based on continued improvement in physics-based computational chemistry and the accompanying software packages. The second challenge needs concerted action from specialists and the larger community. Open sourcing software packages is a stage in the correct direction, but the chemical community has a long history of resisting assistive software either due to poor usability or unreliable software performance [1].

The future of synthetic chemistry is unthinkable without AI technologies. The latter is demonstrably addressed by these powerful methods, but the former requires conscious development of usable software packages with feedback from the community. These ways are made to empower chemists.

The following are a collection of guidelines to help in the initial application of these procedures. The critical review highlights the significance of “dealing with big-data” in one hand; and approaching few-shot learning or zero-shot learning on the other hand which might include:

Full-Data-based Modeling:

- Python has become the coding language of choice for deep learning and finding someone proficient in it is invaluable.
- Deep learning requires large volumes of data to outperform traditional machine learning methods. Unless transfer learning is an option, a few thousand data points is a minimum.
- To begin with, employ the open source software packages referenced above with default settings to get a baseline. of values of the sensors through Gauges

Few-Data- based Modeling:

- From this baseline, adapt the network architecture using techniques presented in the literature referenced in this review to try and improve performance.
- Utilize the wealth of informative online courses and user friendly software packages provided by the deep learning community to aid in learning these techniques.

AI technologies should be studied by all chemists, along with quantum chemistry and molecular modeling, because the future of chemistry special synthetic chemistry is unthinkable without AI technologies.

REFERENCES

[1] A. C. Mater and M. L. Coote, "Deep learning in chemistry" Journal of chemical information and modeling, vol. 59, no. 6, pp. 2545-2559, Jun 2019.

[2] G. B. Goh, N.O. Hodas, and A. Vishnu, "Deep Learning for Computational Chemistry", Journal of computational chemistry, vol. 38, no. 16, pp. 1291-1307, 2017.

[3] J. S. Smith, O. Isayev, A. E. Roitberg, "ANI-1: an extensible neural network potential with DFT accuracy at force field computational cost," Chemical Science, vol. 8, pp. 3192-3203, 2017.

[4] J. Gilmer, S. S. Schoenholz, P. F. Riley, O. Vinyals and G. E. Dahl,"Neural Message Passing for Quantum Chemistry", arXiv:1704.01212,2017.

[5] H. Cho, and I. S. Choi, "Three-Dimensionally Embedded Graph Convolutional Network (3DGCN) for Molecule Interpretation" arXiv: 1811.09794, 2018.

[6] F. Li, R. Fergus, and P. Perona, "One-shot learning of object categories. IEEE Trans. Pattern Anal," Machine Intell.vol. 28, pp. 594−611, 2006.

[7] H. Altae-Tran, B. Ramsundar, A. S. Pappu, and V. Pande, "Low Data Drug Discovery with One-Shot Learning," ACS Cent. Sci. vol. 3, pp. 283-293, 2017.

[8] I. Deznabi, B. Arabaci, M. Koyutürk, and O. Tastan, "DeepKinZero: Zero-Shot Learning for Predicting Kinase-Phosphosite Associations Involving Understudied Kinases", Bioinformatics, vol. 36, no. 12, pp.3652-3661, 2019.

[9] A. Roy, D. Ghosal, E. Cambria, N. Majumder, R. Mihalcea,and S. Poria, "Improving Zero Shot Learning Baselines with Commonsense Knowledge", arXiv:2012.06236, 2020.

[10] [10] J. S. Smith, B. T. Nebgen, R. Zubatyuk, N. Lubbers, C. Devereux, K. Barros, S. Tretiak, and O. Isayev, "quantum chemistry through transfer learning," ChemRxiv: 6744440, 2018.

[11] O. A. Lilienfeld, "Quantum Machine Learning in Chemical Compound Space", Angewandte Chemie International Edition. Vol. 57, no. 16, pp.4164-4169, 2018.

[12] K. T. Butler, D. W. Davies, H. Cartwright, O. Isayev, and A. Wals, "Machine learning for molecular and materials science", Nature, vol. 559, no.7715, pp. 547-555, 2018.

[13] K. T. Schütt1, H. E. Sauceda, P. J. Kindermans, A. Tkatchenko, and K.R. Müller, "A deep learning architecture for molecules and materials",The Journal of Chemical Physics,vol. 148, no.24, p. 241722, 2018.

[14] M. H. S. Segler, T. Kogej, C. Tyrchan, and M. P. Waller, "Generating Focused Molecule Libraries for Drug Discovery with Recurrent Neural Networks", ACS Central Science, vol. 4, pp. 120−131, 2018.

[15] C. W. Coley, W. H. Green and K. F. Jensen, "Machine learning in computer-aided synthesis planning" Accounts of chemical research, vol. 51, no. 5, pp. 1281–1289, 2018.

[16] E. Corey, W. T. Wipke, R. D. Cramer, W. J. Howe, "Computer-Assisted Synthetic Analysis. Facile Man-Machine Communication of Chemical Structure by Interactive Computer Graphics" J. Am. Chem. Soc., vol. 94, pp. 421−430, 1972.

[17] Machine Learning for Pharmaceutical Discovery and Synthesis Symposium, ASKCOS. http://askcos.mit.edu/ (accessed May 08,2019).

Smart Glasses for Displaying Multimeter Readings

Chiranjeet Chaudhary
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
chiranjeetc40@gmail.com

Yash Chaughule
Electronics Department
Thakur College of Engineering and Technology
Kandivali (East),
Mumbai - 400 101
yashchoughule@gmail.com

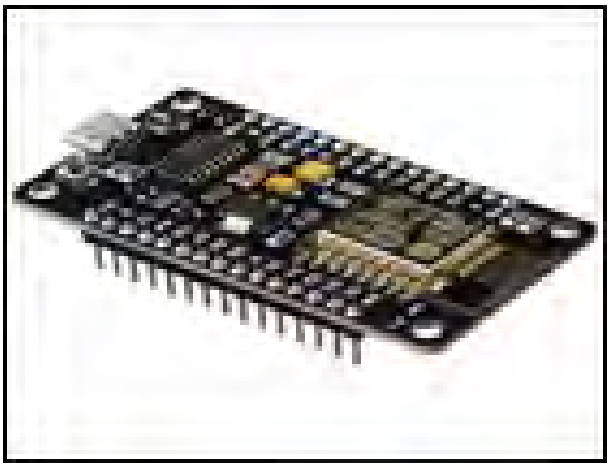
Sushant Tiwari
Electronics Department
Thakur College of Engineering and Technology
Kandivali (East)
Mumbai - 400 101
vivekgurav1910@gmail.com

***Abstract* — Nowadays people are using smart glasses in various fields for the high level of their productivity. Till now smart glasses have been majorly used in various medical & gaming fields. The major advantage of smart glasses is that it helps the users to see graphics in front of their eyes. Our project is based on the same concept which helps users in many aspects. When a person is working with a live electrical board or a person working in industry under high voltage or a student working with a complex project, the person has to note down the readings through a multimeter, but there is no special place to keep the multimeter. The user always has to turn his/her head to see the readings while ensuring a proper placement of the multimeter wires. When working with AC/DC high voltages, it is always riskier to note down readings while looking at the multimeter along with ensuring proper placement of multimeter wires. Therefore, these wearable smart glasses will help the user by displaying the readings in front of their eyes, and thus the users won't have to turn their heads to see the readings. In this project we are going to make use of Bluetooth modules for transferring the readings from multimeter to the glasses along with an OLED display & Lippo battery.**

Keywords— Smart Glass, IoT, Microcontroller, OLED Display, Multimeter, Database

I. INTRODUCTION

At the fuse box there is no special provision to keep the multimeter. The technician must turn his/her head to see the readings while ensuring a proper placement of the multimeter wires. Using a multimeter without proper precautionary measures will cause fatal burns. This is too risky. Therefore, to solve this issue we can use smart glasses. A smart glass is an equipment attached to our goggles/spectacles which shows readings directly at the glass of the goggles/spectacles thereby minimizing the risk of electrical shock. By using these smart glasses the user can freely see the readings without any hindrance. The smart glasses can also be connected to a database which will store the readings taken from the electric meter. This addition will be quite useful in taking down the readings and it will enhance the use of conventional DMM. This project will surely help the electricians as well as the students ensuring their safety while taking the readings.



Taking down the readings from a switchboard or from an electric meter is an everyday task of an electrician. The process of noting down the readings is quite troublesome. This process has been the same for most of the years despite newer technologies coming to birth almost every day. The use of DMM is very important for electricians whether it be for measuring the monthly readings or in any case of emergency. Also, the use of DMM is a part of engineering students who work with circuits. Considering these varied applications of DMM we have to take into account the danger associated with it. One of the most important aspects is the safety associated with it. There have cases where the users have been electrocuted while noting down the readings [1]. This happens due to the less mobility of the DMM. There is no special provision to place the DMM from where the user can see the readings without disturbing the position at which the DMM wires are placed. Due to this the wires of DMM placed, can unknowingly touch any live component while the user is busy in seeing the readings. To avoid this accident. We plan to design an equipment which when worn by the user will let him/her know the DMM readings while concentrating on the DMM wires.

II. PROPOSED FRAMEWORK

The following hardware components are used:

1. Multimeter
2. Node MCU(ESP8266)
3. Bluetooth Sensor
4. OLED Display

5. Plano-Convex Lens
6. Lippo Batteries

1. Multimeter along with Bluetooth module is used to measure electrical parameters such as Voltage(V), Current(I), Resistance(R), Capacitance(C).

Fig.1 Multimeter

2. The hardware of the project comprises Node MCU ESP8266, which uses 128kB of memory and has a storage capacity of 4Mbytes. This module is used for data transmission from arduino to database.

3. Bluetooth Sensor is used to for wireless transmission of data from Multimeter to the Microntroller Board.

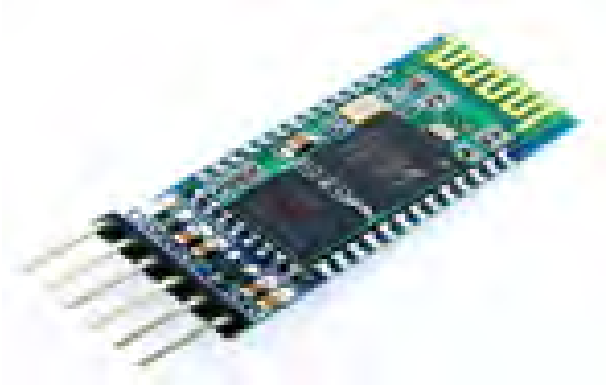


Fig.3 Bluetooth Sensor

4. OLED Display is used to display readings which are transferred from multimeter to the Microntroller Board

Fig.4 OLED Display

5. Plano-convex lens is used to focus the light rays which are coming from OLED Display on reflector.

Fig.5 Plano-Convex Lens

6. Lippo Batteries are used to supply power to the microcontroller and OLED Display.

Fig.6 Lippo Batteries

Following Softwares are used:
1. Proteus Software
2. IBM Cloud
3. Google Sheet
4. Hive MQTT

1. Proteus Software is used for simulation of all the components

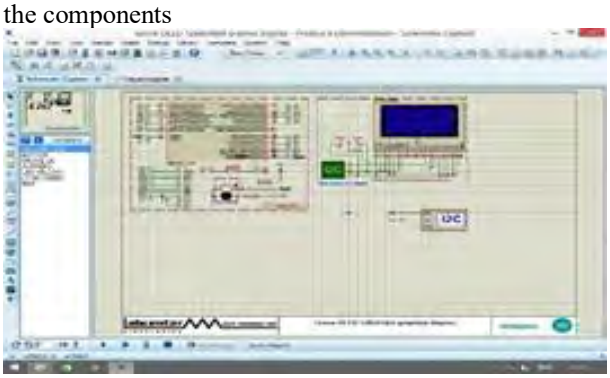


Fig.7 Proteus Simulation

2. IBM Cloud is used to store the reading in database.

Fig.8 IBM Cloud

3. Google Sheet is used as JSON end point for APP to fetch data.

Fig.9 Google App sheet

4. Hive MQTT act as broker between clients

III. PROPOSED ARCHITECTURE & METHODOLOGY

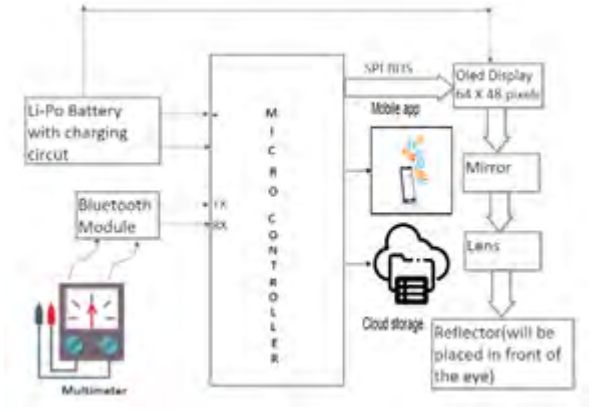


Fig10: Block diagram of Smart Glasses

1. The Multimeter contains a Bluetooth module through which data is transmitted wirelessly to a smart glass module.
2. The Bluetooth module on smart glass receive data from multimeter and send is to microcontroller for processing
3. Microcontrollers process data and communicate with an OLED display to display data on it.
4. Mirror reflects the image from display to lens through which it is projected to reflector from which user can see data.

IV. LITERATURE SURVEY

- DrxMAC which is a new protocol and it reduces memory footprint as well as provides good communication even with low duty cycle. We are implementing this protocol to increase wireless communication as a future aspect[2].
- Privacy issues arise mostly interrupting the smart glass system; these occur by the influence of external devices that are connected to a network or sensitive towards electronic interference. Smart glasses should be made with optimum components to ensure safety of eyes[3].
- OLED are flexible than LED and have Large field of view, around 180 degrees as well as Very less harmful to human eye and consumes less power. A small piece of OLED screen can be used to improve the working life of the glasses [4].
- All the recorded readings are displayed on the mobile app & the user has to manually press key to save particular reading. By directly using audio command (speech to text convertor). We can save the recorded readings [5].
- The sensor is connected with SpO2 system mounted on printing circuit board. It senses PPG signal. Software on PC can record wireless PPG signals of patients to calculate SpO2 and heartbeat rate.[6]

V. DESIGNING MODEL

1. Sensing the Multimeter readings

This device can be used at Hospitals and Medical Facilities where there is shortage of Doctors and Hospital Staff. As this is a low-cost device it has application in rural areas where there are hospitals that cannot afford the cost of large-scale equipment.

2. Transferring the readings to the controller

This step involves the transferring of multimeter data wirelessly to the microcontroller. After the user takes the readings, the data from the DMM is transferred to the controller using the Bluetooth transmitter in the DMM and received by the controller using the Bluetooth receiver. The controller then passes these readings to the OLED screen.

3. Display readings on the display

After the transferring is completed by the controller, the readings will be first available on the OLED display. But since we cannot directly attach the OLED screen near the eye due to its connections, the light rays are passed to the mirror for reflecting it at a particular angle.

4. Final display of the readings on reflector

The final step will be reflecting the readings from the lens at the proper distance to the reflector so that the user gets to see the readings which are properly focused.

5. Display the data on mobile application

Finally display same data on mobile application along with graphical interface

VI. APPLICATIONS

1. Medical Facilities and Hospitals

Industry people can use our project for measuring high magnitude parameters thereby decreasing the chance of touching live wire which can cause fatal burns and, in some cases, even death. It can also be used to increase the efficiency of the number of measurements.

2. At Our houses

While taking electrical measurements in our home there is a chance of touching the live wire because a person may not be experienced with electrical equipment. Our project can provide safety to User while taking the measurement.

3. Educational Institutes

Educational institutes can use this project for safety of students and mainly to increase efficiency of students while taking large no measurement data can be stored in electronic equipment so that it can be easily reproduced, shared and analyzed.

4. Hobbyist's and Students

Students studying in any course can use our machine to measure electrical parameters in a small amount of time and see analyzed data, this will lead to an increase in interest for the field of electronics among the students. The Hobbyists who make various circuits frequently can debug circuits easily by analyzing data while measuring

VII. RESULTS

With the implementation of the product described in this paper, the aim is to efficiently monitor the multimeter readings and display the data on the glasses as well as on the mobile application. Data is also stored in the database for time-to-time analysis.

VIII. FUTURE SCOPE

A system can be developed which will continuously monitor readings and display the changes in the form of mobile notifications [7].

ACKNOWLEDGMENT

Our project, 'Smart Glasses for Measuring Multimeter Readings' has been possible because of our teacher and project guide Mrs. Archana Belge(Assistant professor ELEX) who provided us with guidance and motivation throughout its making. We thank her for giving us an opportunity to create this project. We are also thankful to Dr. S.C Patil (Electronics Department, HOD) for his guidance and to our parents for providing all possible resources to gain the best possible knowledge. Finally, we would thank our college 'Thakur College of Engineering and Technology' for providing us with a platform and the necessary facilities to make this project.

REFERENCES

[1] Thad Starner, "Project Glass: An Extension of the Self", PERVASIVE computing, Editor: Bernt Schiele,1536- 1268/13/$31.00 © 2013 IEEE, Page No.-14-16, Published by the IEEE CS, April–June 2013

[2] L. Lee and P. Hui, "Interaction Methods for Smart Glasses: A Survey," in IEEE Access, vol. 6, pp. 28712-28732, 2018, doi: 10.1109/ACCESS.2018.2831081.

[3] B. A. Detail and C. Y. Yeun, "Recent advances of smart glass application security and privacy," 2015 10th International Conference for Internet Technology and Secured Transactions (ICITST), London, 2015, pp. 65-69, DOI: 10.1109/ICITST.2015.7412058.

[4] Nallapaneni Manoj Kumar, P. Ranjith Krishna, Pavan Kumar Pagadala, N. M. Saravana Kumar Use of Smart Glasses in Education-A Study, Proceedings of the Second International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC 2018) IEEE Xplore Part Number: CFP18OZV-ART; ISBN:978-1-5386-1442-6

[5] Josh P, Definitions Of Glass, Smart Glass And Smart Glasses, 22nd July 2014.

[6] Anup Deshmukh, Akshay Chavan, Rohit Marathe, Prof. Pooja Shinde, SMART DATA GLASSES FOR MULTIMETER, International Research Journal of Modernization in Engineering Technology and Science,Volume:02/Issue:06/June -2020, e-ISSN 2582-5208.

[7] Kun Xia, Hua Su, Jiawen Ni, Bangzheng Liu, Yanghong Ye, and Han Li, Smart Pen-Shaped Digital Multimeter System Based on IoT and Cloud, IEEE Instrumentation & Measurement Magazine, December 2019.

Designing Flood Prediction System Based on Weather Parameters using ML Model

Shraddha Gupta
Department of Electronics Engineering
Thakur College of Engineering and Technology
Mumbai, India
shraddhagupta2709@gmail.com

Nairuti Mehta
Department of Electronics Engineering
Thakur College of Engineering and Technology
Mumbai, India
nairutimehta11@gmail.com

Akshata Parulekar
Department of Electronics Engineering
Thakur College of Engineering and Technology
Mumbai, India
parulekarakshu@gmail.com

***Abstract*— Floods are one of the natural disasters that have a huge impact on human lives as well as properties. The life damage and economic loss caused by the flood has put more burdens on economy than any other natural disaster. India has been suffering from many flood events which affirmed large amount of loss of economy and life. Specially, in the Mumbai region, which is the economic center of the country, the damages are intolerable. Due to reasons like climate changes, poor river management, silting, cloud bursting, tsunami, the frequency of floods is rapidly increasing. The research on the advancement of flood prediction models contributed to risk reduction, policy suggestion, minimization of the loss of human life, and reduction to the property damage associated with floods. Thus, to prevent the immense destruction, we have proposed a system which will take into account parameters such as rainfall, satellite images, precipitation and humidity, which will help us predict flood in Mumbai region. The main approach of this project is to use supervised learning model, in which we will feed our training set data. Using this training set data, the model will be trained. Then for predicting the outcome, present parameters will be fed to the model as input, comparing this input with its previously learned experience, it will give us the outcome that is whether the flood will occur or not in Mumbai city. In addition, a deep learning model is used in order to increase the efficiency in terms of accuracy and error. This system can be used for flood forecasting with highest accuracy based on monsoon parameters only before flood occurrence.**

Keywords—Image processing, Supervised learning, image segmentation, Python, Flood prediction, binary classification mode, training set data, Weather parameters.

I. INTRODUCTION

Floods are the most destructive natural disasters causing huge damage to human lives, agriculture, infrastructure and socioeconomic system. Government has been under pressure to establish an accurate map of flood prone areas and to develop a well-grounded flood risk management system for prevention. Hence, flood prediction model are important to prevent and diminish the damage occurring in the society. An accurate model is needed for the prediction so that there is slight damage or no damage at all. Flood prediction models take into account many parameters such as temperature, location, humidity, water level, etc. More the number of parameters better is the accuracy. Many flood predicting models have been introduced in the society. These models are made either by using machine learning, deep learning or artificial intelligence, etc. Using such models both short-term and long-term floods can be predicted and make scarce damage.

Physical based modeling was used for the prediction of floods through events such as storm, water pressure, rainfall etc.

There are three different types of machine learning models- clustering, classification and regression. Regression models are used to predict dependent variable in a set of independent variable while classification models are used for approximating a mapping function. We have chosen three models for the implementation of our project. Those are linear regression, logistic regression and naïve bayes. Abundant data is required for a reliable long term prediction of floods. The drawbacks of physically based models and data driven models are prevailed by Machine learning models. Machine learning models are prominent because they help to numerically formulate flood nonlinearity based on historical data without requiring the knowledge of the physical processes. Machine learning is a type of Artificial Intelligence. It allows software to accurately predict the output, without being explicitly programmed to do so. Machine learning algorithms use historical trained data as input for the prediction of output. There are four basic types of machine learning models based on the type of data to be predicted- Supervised learning, unsupervised learning; Semi supervised learning and Reinforcement learning. Supervised and unsupervised learning models are more widely used. These learning models are used to induce patterns and regularities which provide easy implementation. They are low cost and have fast training, validation and high performance. These are more reliable compared to physical models. The constant advancements and popularity of machine learning shows the accuracy level and its suitability to predict flood. Machine learning algorithms such as support vector machine (SVM), neuro fuzzy, artificial neural network etc. are considered to be effective for prediction of flood. The amount of data needed for the models should be more because if less amount of dataset is provided to the machine learning model then, the model might give less accurate output. Therefore, large amount of data should be fed to the model so that the model is trained well.

Hence, we have proposed a flood prediction system using machine learning which will provide us accurate results.

II. IMAGE SEGMENTATION

An image consists of set of pixels. We can separate these pixels with the help of a concept called image segmentation. In image segmentation, the images can be divided into small segments. We can either process the entire image or some parts of it as there may be some regions in the image where no information is present. Image segmentation is a small portion of the image processing technique.

There are a lot of image segmentation techniques such as Region based segmentation, Edge detection segmentation, Image segmentation based on clustering and Mark R-CNN. In region-based segmentation, we separate the objects into different regions based on some threshold value whereas segmentation technique is based on clustering, it helps to divide the pixels of the image into homogeneous clusters. Edge detection segmentation makes use of discontinuous features of an image to determine edges and defines a boundary of the object. In Mask R-CNN, three outputs are given for each of the object in the image- class, object mask and boundary box coordinates.

We have applied regional image segmentation using google collab, as it provides high processing speed. The images were converted into two band format for better processing. Then a threshold value was calculated to differentiate land and water bodies. This separation was marked with a border on its edge and filled with different colours to mark both different regions. Initially, the satellite images were in tiff format, when collected from the official website. But to work on them using Python, they were required to be in more of a manageable format. So they were converted into PNG format using, the QGIS software.

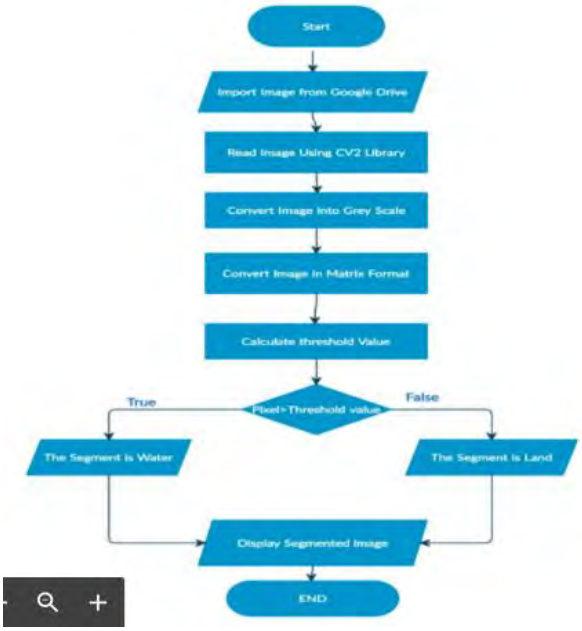


Fig. 1- Flowchart of image segmentation

The images were stored in the google drive. The images were imported into the python code from the google drive. We used CV2 library to read the original images and convert them to grey scale. Once, the BGR image is converted into grey scale, we convert the grey scaled image into matrix form which gives us the pixels value. Then we set the threshold value. Depending on the pixel values, if it exceeds the threshold value then the segment was labelled as water, otherwise the segment would be labelled as land. As the bifurcation of the images was done, the segmented images were derived as output.

III. PARAMETERS

Floods can be predicted through various parameters such as sea level, temperature, humidity, rainfall etc. Therefore, the input parameters that will be given to the machine learning model are satellite images, temperature, precipitation, humidity and rainfall. We have used satellite images to determine the water level in the Mumbai region. The rate of change of water level can indicate the severity of the threat. Larger the amount of rainfall more is the chance of flood taking place. Hence, amount of the rainfall in the region of Mumbai is taken into account. As the temperature rises, the air can contain more moisture, which can condense to fall as rain. Therefore, determining temperature is also important in flood prediction.

Fig.2. Flow Chart

We have organized the input parameters in the form of the Excel sheet which will be the training dataset given to the supervised learning model. We have extracted the parameters- temperature and precipitation from the government site, NOAA (National Oceanic and Atmospheric Administration). Since we needed the data from previous years, we had to send a request to the concerned authority for the dataset of temperature and precipitation. They approved our request and we were given the temperature and precipitation of the Mumbai region from the year 2010 till 2020.

IV. SUPERVISED LEARNING MODEL

Supervised learning is an algorithm or a method in which is used to characterize set of training data to train a system. We create a model by using a labelled training data set that consists of input parameters and an intended output. The supervision comes in the form of wanted output which lets us to adjust the threshold value of the system based on the actual output that is produced. When the system or the model is trained, we can apply it to new inputs or observations to produce an output

that will respond ideally. Supervised learning also includes a feedback which will indicate whether the function is correct or not and then accordingly alter the function to produce the correct output. There are mainly two types of algorithms- Regression algorithm and Classification algorithm. Regression algorithm is used predict a continuous output whereas the classification algorithm is used to determine discrete output (yes or no, 0 or 1). Since, we need a discrete output i.e. whether the flood will occur or not, we have used classification algorithm. There are seven types of classification algorithms namely logistic regression, Naïve Bayes, Stochastic Gradient Descent, K-Nearest Neighbors, Decision tree, Random forest and Support Vector Machine.

We will be designing a flood prediction system using supervised learning model. The input parameters such as humidity, rainfall, precipitation and satellite images will be given to the supervised learning model in the form of training dataset. By analyzing this training dataset, the model will produce an inferred function to make the prediction of the flood. This model will also provide targets for any new input after sufficient training. The model will also compare its output with the correct, intended output and find errors in order to modify the model accordingly. After all the feedback and corrections are completed, the model will predict whether the flood will occur or not.

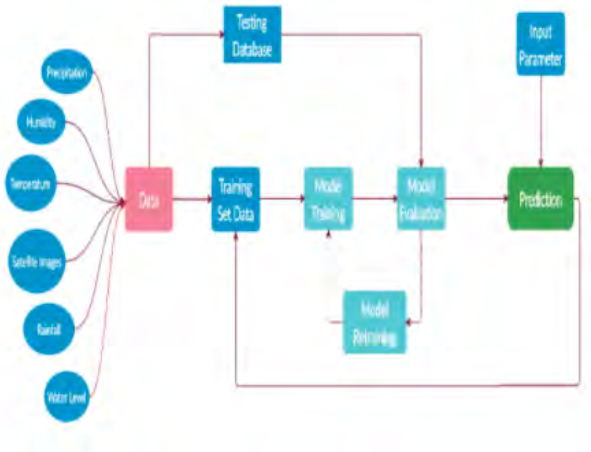


Fig. 3 Block Diagram

V. FUTURE SCOPE

The project can be used by the government for predicting the flood. And accordingly the government can take the necessary actions to prevent huge destruction. Further making some changes in the dataset such as the rainfall, temperature etc., and this model can be applied to other parts of India as well. More advancement can be done by adding response systems in the model, with the help of which, the model can automatically take actions if flood is predicted.

VI. RESULTS

Fig. 4 is the output obtained from the segmented process. The below image is a part of Mumbai region taken from a government recognized site. The region filled in black colour is a water body while the region in white is covered with land. These two regions are separated by a boundary which is displayed by a thin green outline.

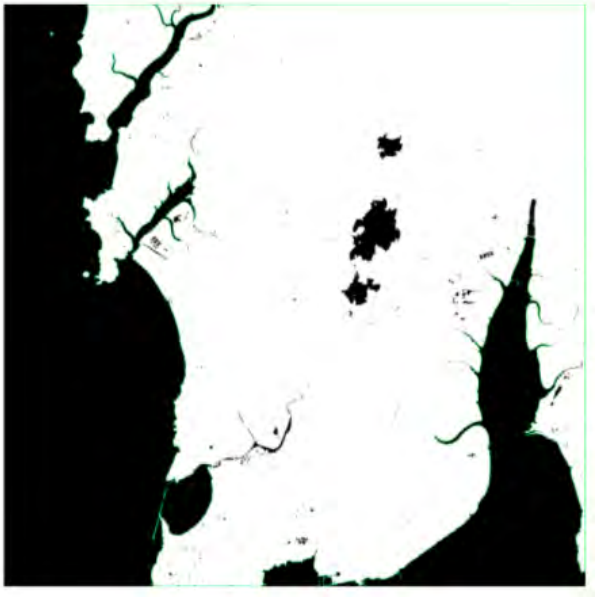


Fig. 4.

The following is the output obtained which represents the accuracy obtained from the model. We will further compare the accuracies of the models implemented.

```
No of Neighbours 1 Accuracy 99.40762680488707
No of Neighbours 2 Accuracy 99.51869677897075
No of Neighbours 3 Accuracy 99.55572010366531
No of Neighbours 4 Accuracy 99.51869677897075
No of Neighbours 5 Accuracy 99.51869677897075
No of Neighbours 6 Accuracy 99.51869677897075
No of Neighbours 7 Accuracy 99.51869677897075
No of Neighbours 8 Accuracy 99.51869677897075
No of Neighbours 9 Accuracy 99.51869677897075
No of Neighbours 10 Accuracy 99.51869677897075
No of Neighbours 11 Accuracy 99.51869677897075
No of Neighbours 12 Accuracy 99.51869677897075
No of Neighbours 13 Accuracy 99.51869677897075
No of Neighbours 14 Accuracy 99.51869677897075
No of Neighbours 15 Accuracy 99.51869677897075
No of Neighbours 16 Accuracy 99.51869677897075
No of Neighbours 17 Accuracy 99.51869677897075
No of Neighbours 18 Accuracy 99.51869677897075
No of Neighbours 19 Accuracy 99.51869677897075
No of Neighbours 20 Accuracy 99.51869677897075
No of Neighbours 21 Accuracy 99.51869677897075
No of Neighbours 22 Accuracy 99.51869677897075
No of Neighbours 23 Accuracy 99.51869677897075
No of Neighbours 24 Accuracy 99.51869677897075
No of Neighbours 25 Accuracy 99.51869677897075
```

Fig. 5

ACKNOWLEDGMENT

I would like to communicate my most profound thankfulness to every one of the individuals who gave me the likelihood to finish this report. An exceptional appreciation I provide for our task guide Dr. Sandhya Save whose commitment in animating proposals and encouragement, helped me to facilitate my project, in-

vested endeavors in managing the team and gave us the vision to make this stage. Also, grateful for the direction given by all other supervisors too. An uncommon amount of gratitude goes to my group, who helped me throughout the time, who helped me all through the venture by giving their significant commitment as thoughts, structure arranging and usage.

Finally, we would thank our college 'Thakur College of Engineering and Technology' for providing us with a platform and the necessary facilities to make this project.

REFERENCES

[1] R. Keshari, "Prediction of whether a flood may occur or not, depending rainfall data, using machine learning algorithms", October 2018.

[2] V. Jatana, "Machine Learning Algorithm", May 2019.

[3] R. Dixon, H. Malini and B. Ayyalasomayajula, "Description and impacts of the Mumbai monsoon flood of July 2005", presented at Papers of the applied Geographical Conference, January 2008.

[4] S. Sankaranarayanan, M. Prabhakar, S. Satish, P. Jain, A. Ramprasad and A. Krishnan, "Flood prediction based on weather parameters", Journal of Water and Climate Change jwc2019321, November 2019.

[5] P. Tripathi, "Flood Disaster in India: An Analysis of trend and Preparedness" , Interdisciplinary Journal of Contemporary Research, Volume 2, No. 4 , ISSN: 2393-8353, September 2015.

[6] P. T. Kadave, A. D. Kale and S. Narwade, "Mumbai Floods, Reasons and Solutions", International Journal of Scientific and Research Publications, pp.224-228, Volume 6, Issue 3, March 2016.

Fingerprint Enhancement and Feature Extraction

Sonal Singh
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
sonalsingh2799@gmail.com

Yogita Prajapati
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
prajapatiy36@gmail.com

Mansi Singh
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
mansisingh04470@gmail.com

Dr. Sangeeta Mishra,
Professor
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology, Mumbai - 400 101
sangeeta.mishra@thakureducation.org

***Abstract*— Biometrics based security system provides high level of accuracy. The most commonly used biometric based security system is fingerprint recognition. This paper focuses on enhancement of fingerprint and extracting features using Minutiae based approach in order to provide high accuracy in pattern recognition. This approach involves extraction of important features from fingerprint such as ridge ending and ridge bifurcation. The method used for feature extraction is called as Crossing Number Computation in order to have high accuracy in pattern recognition.**

Keywords—Minutiae, Ridge ending, Ridge bifurcation, Security, Fingerprint, Feature Extraction

I. INTRODUCTION

The password authentication system cannot be considered as a reliable system due to confidentiality and cost issues. The legal ramifications of losing sensitive data and the consequent breach of privacy is huge. Anyone, with the knowledge of password can gain access to unauthorized information, making the password authentication system more vulnerable to hacking because the possibility of human error cannot be ruled out. With the rising technological advancements each day, organizations need to have an adaptive and agile security system. The Biometric based systems are in great demands now-a-days because of their higher efficiency, convenience, better security. Biometric System uses the distinctiveness of physical characteristics (face, iris, fingerprint) or behavioural characteristics (voice, signature, etc.). Various application uses different number of biometric traits, however the fingerprint is the most common and reliable biometric in terms of application because of their universality, high distinctiveness and high performance.

The term "Security" defines the protective measure which need to be taken in order to protect the data or the system from the unauthorized access. With an aim to provide digitized security system the Biometrics involving the Fingerprints provide a very beneficent System. With fingerprints being unique, it is next to impossible for someone to break into the premises with use of a biometric system because each person has a unique fingerprint, which is the only criteria required to get access. The fingerprint based security system is faster, more convenient, provides a better authentication and offers low FARs.

The project focuses on applying rigorous pre-processing which involves filtering, normalization, segmentation, binarization and thinning. This will ensure removal of noise from the input image which will make the feature extraction process more efficient. The feature extraction process involves extraction of minutiae points such as ridge ending and ridge bifurcation from the fingers which will help in marking the unique points.

II. METHODOLOGY

The enhancement of fingerprint can be performed using either average filter, fixed median filter or adaptive median filter. But, it is observed that the average filter is sufficient in removing the Gaussian Noise but fails for the removal of impulse noise. Median filter comes into picture for the removal of Impulse noise, but due to the fixed window size and shape of the filter it is found to be less effective and the use of this filter degrades the image enhancement process. Instead of Median filter, Adaptive Median filter can be used. In this, the size of filter window is adjusted by calculating mean of the pixel[1].

For feature extraction, the different computational algorithms like Learned templates-based minutiae extraction is used to detect the presence of minutiae and templates are applied with appropriate orientations to the binarized fingerprints only at selected potential minutiae locations. Experimental results shows that learned templates can improve both the detection of features and the performance of an identification system. In this Primitive features, based on the orientation image, are used that allow incorporation of domain knowledge into the evolutionary computational process. The experimental results of the proposed approach, Learned templates-based minutiae extraction system not only shows that the proposed approach can achieve good performance when a large portion of

fingerprints in the database are of poor quality, but also shows that it is better than other approaches[2].
An automated latent fingerprint recognition algorithm utilizes Convolutional Neural Networks (ConvNets) for ridge flow estimation and minutiae descriptor extraction, and extract complementary templates (two minutiae templates and one texture template) to represent the latent. The comparison scores between the latent and a reference print based on the three templates are fused to retrieve a short candidate list from the reference database. Though experimental results show that the proposed method performs significantly better than published algorithms on two benchmark databases (NIST SD27 and WVU latent DB) against 100K rolled prints, it is not considered to improve the recognition effectiveness[3].

III. GAP ANALYSIS

The filtering process involves the use of Adaptive Median filter for the removal of noise from fingerprint [1]. Adaptive Median filter can be used to solve the problems of fixed window size of the median filter. The window size of the adaptive median filter can be changed according to the pixel value which results in a clear image eradicating the blurriness. But, the main disadvantage of this filter is that, in order to remove the noise and preserve the fine details adaptive median filter needs to be applied repeatedly which slows down the system to a certain extent. For, feature extraction process, the different feature extraction algorithms like Learned templates-based minutiae extraction and Automated latent fingerprint recognition algorithm can be used[2][3]. But, although these algorithms perform efficient feature extraction, there are still lot of challenges that needs to be addressed. The distortion of fingerprint makes feature extraction process more difficult, if the recognition system can reject the bad quality image before processing them, performance can be improved better. Also, the features in fingerprints including minutiae and grayscale features are weighed differently depending upon the algorithm[3]. There is a need to improve the speed of feature extraction and comparison as the above process is too lengthy and time consuming. Instead, it is required that the feature extraction process should extract dominant characteristics in fingerprint and their location like Crossing Number Computation.

IV. PROPOSED METHODOLOGY

The Biometric based systems are in great demands now-a-days because of their higher efficiency, convenience, better security. Biometric System uses the distinctiveness of physical characteristics (face, iris, fingerprint) or behavioral characteristics (voice, signature, etc.). Various application uses different number of biometric traits, however the fingerprint is the most common and reliable biometric in terms of application because of their universality, high distinctiveness and high performance. A fingerprint security system consists of enrolment, verification o user as well as identification of a user. Although fingerprint has been present from a very long, distortion of impression of fingerprint makes it a challenging problem.
Fingerprint is a group of curves which consists of valleys (white curve) and ridges (dark curve). Fingerprint has some unique points called minutiae points. The minutiae points can be of two types: Ridge ending where ridges or dark line end and Bifurcation where ridges split into two. The minutiae points are shown in Figure 1[6].

Fig.1. Example of Ridge Ending and Ridge Bifurcation

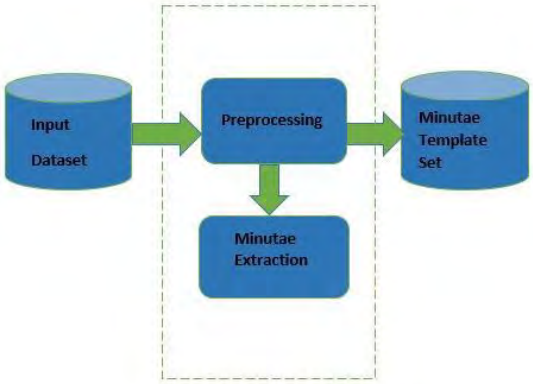


Fig.2. Block diagram of Feature Extraction

The fingerprint recognition system in figure 2 is comprised of:

a. Input: Reading Fingerprint from sensor
b. Pre-processing: Removal of noise
c. Minutiae extraction: Extracting features from fingerprint

I. Input: In order to read fingerprint, nowadays Scanners are used with sensing element in it. It consists of Sensors, A/D converter and Interface. The different types of Sensors mentioned are as follows-
Optical Sensors: Converts light rays into electrical signals.
Solid State Sensors: It's surface is of silicon which consist odd array of pixels which user touches directly. The selected Scanner should give more area, no of pixels, resolutions. Before moving to Minutiae extraction. The process is further classified into pre-processing.

II. Pre-processing: It is an important step to acquire a quality image by processing the input image and thus proves to be crucial stage between image acquisition

and feature extraction. In order to locate the ridge endings and ridge bifurcations, commonly termed as minutiae points which is the most commonly used feature in the fingerprint due to the small template size and impressive speed, the acquired image is required to pass through a series of pre-processing stages viz. Filtering, Normalization, Binarization, Segmentation and Thinning.

1. Filtering: The input image acquired from the fingerprint module contains various kinds of graphic disturbances or noises which needs to be discarded to obtain an image of high quality in order to get a better grasp over the fingerprint patterns. It is often believed that the process of fingerprint image enhancement process determines the accuracy of the feature extraction and feature recognition to a certain extent [1]. The query image acquired from the input contains various types of noises like Impulse Noise, Gaussian Noise, Speckle Noise and Poisson Noise etc. The system mainly focuses on removal of impulse Noise which is also called as the Salt & Pepper Noise which leads to appearance of spots on the query image resulting to its deterioration. Since the signal intensity of the Impulse noise is greater than the intensity of the query image, it appears to be black point (minimum gray scale) and white point (maximum gray scale) [1]. An adaptive median filter is used in order to remove the impulse noises as the fixed median filter is capable of partial removal or blurriness of the image [1].

2. Normalization: The image obtained from the filtering process contains a wide range of pixel intensity values. The fingerprint mainly consists of ridges and valleys due to which the query image acquired contains a variation in the Gray- Scale levels leading to a different contrast levels in the acquired image [4]. The series of calculations of mean and Variance from the pixels of the noiseless image enhances the quality of the fingerprint image. Histogram Equalization is adapted to overcome this variance and the region with poor contrast are stretched to obtain an image of higher performance value.

3. Segmentation: To get a better grasp over the patterns of the acquired image, segmentation is performed over the image. The segmentation process basically divides the image into the background and the foreground, the foreground image contains the part of interest i.e. the patterns and the background part is ignored. Segmentation leads to the conversion of a low-level grayscale image to a high- level image description in terms of features, objects and scenes [5]. It partitions the image on the basis of similar characteristics containing the pixels. An Otsu segmentation method comprising of Otsu Threshold calculates the levels of spread for the pixel levels each side of threshold and iterating through all possible threshold values [5].

4. Binarization: In the binarization process, the 8- bit Gray-Scale image is converted to a 1- bit Binary Image for better processing. Most of the Minutiae algorithm works on binary image which is interested in two levels :0 for ridges and 1 for valleys. After binarization, the fingerprint is highlighted with ridges and valleys.

5. Thinning: Thinning basically refers to the process of reducing the thickness of the ridge lines present in the image. The process is also referred to as Skeletonization. The process is very important in terms of getting a better analysis of the features necessary for feature extraction. The process also helps in reducing the processing time making the system fast and also helps in reducing the template size of the image which leads to a better database management.

III. Minutiae Extraction: It is a process of Extracting Minutiae points such as Ridge endings and Bifurcation from a fingerprint images. The applied algorithm should be able to retain as much minutiae as possible.

Crossing Number Computation: Crossing Number is used for extraction of minutiae points such as ridge ending and ridge bifurcation. These points are extracted from a skeleton form of fingerprint image. In this method, 3x3 matrix around each ridge pixel is obtained from the fingerprint by using the formula:

$CN=0.5\sum|Pi-P(i+1)|$ [3]

Table 1

Crossing Number	Minutiae Points
0	**Isolated point**
1	Ridge Ending
2	Continuing Point
3	Bifurcation
4	Crossing Point

Using Crossing Number computation, out of the minutiae points mentioned in table 1 [3], only ridge ending and bifurcation are further used for matching of input fingerprint with query image in the datasets.

The algorithm for proposed methodology is shown in Figure 3.

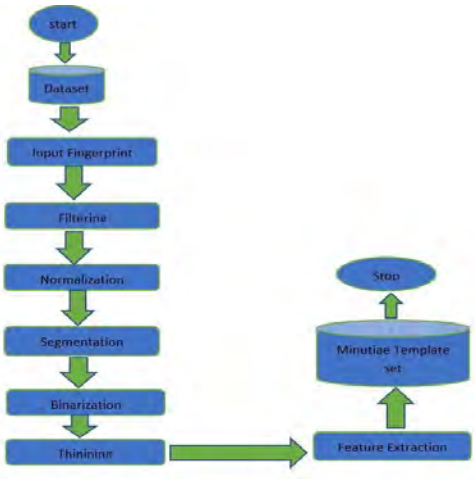


Fig.3. Flowchart of Fingerprint enhancement and Feature Extraction

1. Start
2. Input the 2D fingerprint from dataset
3. Filter the image using Adaptive median filter.

4. Convert the input image into a grayscale image
5. Find histogram of an image
6. Calculate Cumulative frequency of all pixel values
7. Divide the cumulative frequencies by total number of pixels and multiply them by maximum gray count (pixel value) in the image
8. Select initial threshold value T(T=350) and segment the image in a group of 2.
9. If-pixel value <T
set pixel value=0;
Else-
set pixel value=1000;
End
10. Convert the grayscale image into Binary Image
11. Skeletonize the fingerprint.
12. For Minutiae: Set a Window size of 3x3 and move it each pixel
13. Calculate each pixel using CN=0.5∑|Pi-P(i+1)|
14. If-CN=1
set the co-ordinate=Ridge Ending
If-CN=3
set the co-ordinate=Ridge Bifurcation.
15. Store the minutiae template in another Dataset
16. Stop

V. RESULT & DISCUSSION

The main aim of pre-processing stage is to enhance the quality of fingerprint image by removing noise in order to efficiently extract features from fingerprint image. Minutiae-based approach is used because it makes feature matching efficient by focusing on only two main points on fingerprint which is ridge ending and ridge bifurcation.

Fig.4. Original Fingerprint Image

In Figure 4, the four fingerprints belong to LiveDataset FVC2002 and these fingerprints consists of noise.

Fig.5. Filtered Fingerprint Image

In Figure 5, noise redundant images for four different fingerprints are obtained using the Adaptive Median Filter.

Fig.6. Normalized Fingerprint Image

In Figure 6, each pixel is brought in contrast with the other pixel using Histogram equalization in all the four different fingerprints.

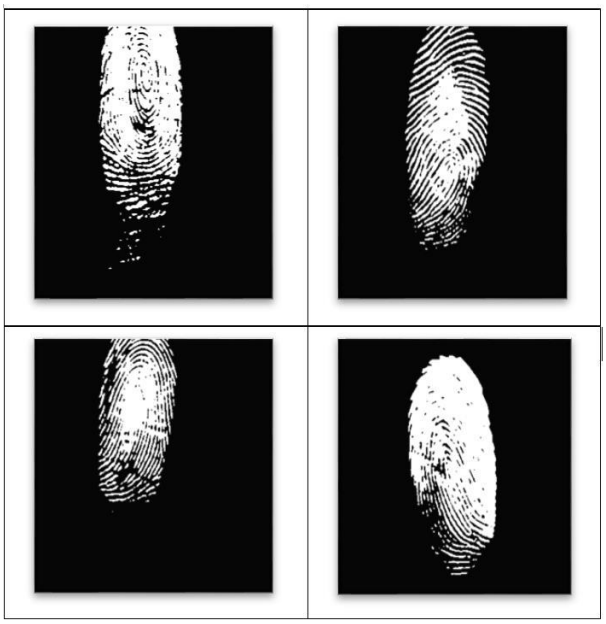


Fig.7. Segmented Fingerprint Image

In figure 7, background image is separated from the foreground image and only foreground image is retained using Global Thresholding for four different fingerprints.

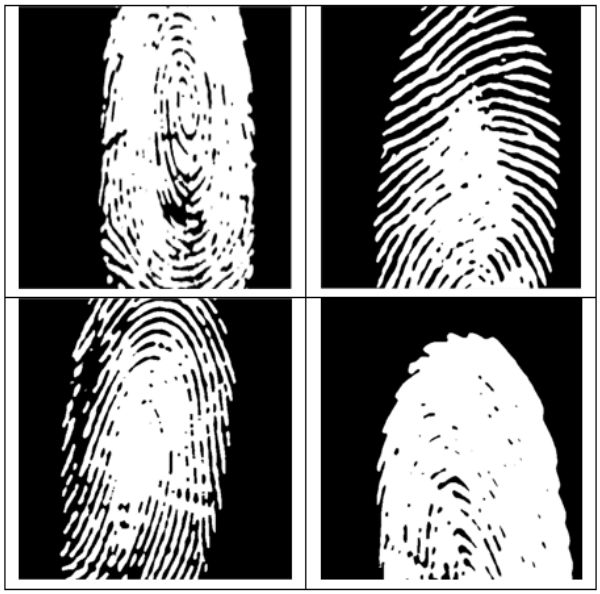


Fig.8. Binarized Fingerprint Image

In Figure 8, binarization is used for zooming the images for clear visibility of ridge lines.

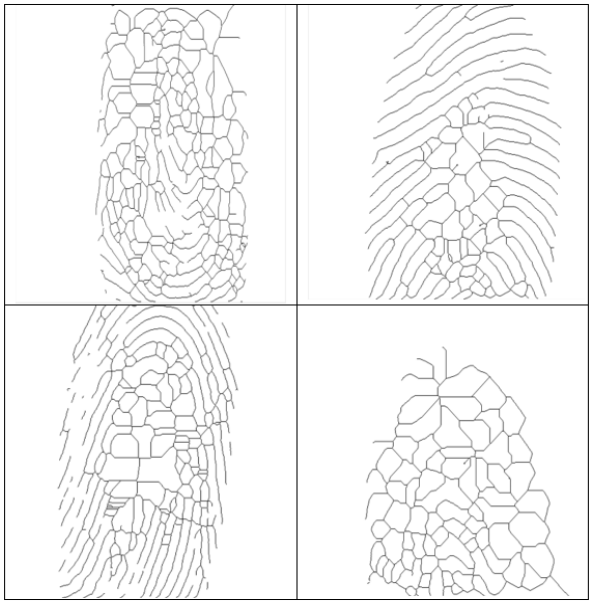


Fig.9. Thinned Fingerprint Image

In Figure 9, skeletonized image of each fingerprint is obtained for clear visibility of minutiae points.

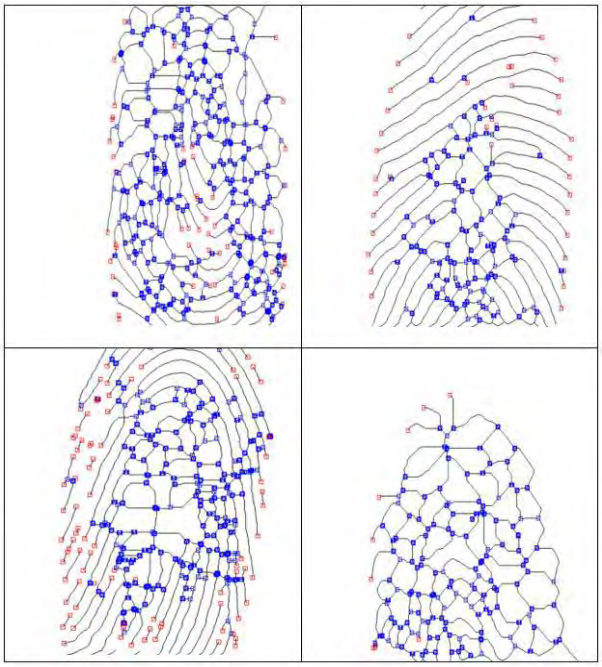


Fig.10. Fingerprint Image containing Minutiae Points

In Figure 10, red points represent Ridge Ending whereas blue points represent Ridge Bifurcation for all the four fingerprints.

VI. Conclusion

In this paper, a base of fingerprint based security system is supposed to implemented by performing enhancement of fingerprint and using efficient feature extraction method which can help in creating a more advanced security system. Instead of texture based analysis and ridge bases analysis, an enhanced way of pattern recognition known as Minutiae based approach is used to obtain features such as ridge ending and ridge

bifurcation from fingerprint. This system will provide more accuracy because the fingerprint first undergoes pre-processing which involves filtering of fingerprint image to eliminate noise, normalization, segmentation, binarization followed by thinning of fingerprint before feature extraction stage. The proposed system will also meet the challenge of locating minutiae points in a distorted fingerprint.

VII. FUTURE SCOPE

Pattern recognition also called as pattern matching can be performed using Neural Network Algorithm which will compare important features of two fingerprint image and the proposed security system will estimate whether the fingerprint belongs to an authorized user or an unauthorized user. The matching of these features using different Neural Network Algorithm will ensure increased speed of the system. The difficulty of defining a quantitatively reliable match between fingerprint images, recognition performance is still a matter of study among researchers. However, for feature matching different CNN models like MobileNet-v1 CNN model, Xception model, Inception model, ResNet model, etc. can be tested and the one which takes less processing time can be used. Further, different systems can also be fused with other biometrics to increase the security significantly.

REFERENCES

[1] Ke Han, Zizheng Wang, Zilong Chen, "Fingerprint Image Enhancement Method based on Adaptive Median Filter", in Asia-Pacific Conference on Communications (APCC),2018.

[2] Bir Bhanu, Xuejun Tan, "Computational Algorithms For Fingerprint Recognition", New York, Springer Science and Business,2004.

[3] Kai Cao,Anil .K. Jain, "Automated Latent Fingerprint Recognition", IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol.41,No.4,April 2019.

[4] Academia.edu,"FPGA Implementation of Normalization block of Fingerprint Recognition Process",2014.[Online].Available:https://www.academia.edu/35469340/FPGA_Implementation_of_Normalization_block_of_Fingerprint_Recognition_Process.[Accessed: 22-Jul- 2020].

[5] Davide Maltoni, Dario Maio, Anil K. Jain, Salil Prabhakar, "Fingerprint Analysis and Representation", in Handbook of Fingerprint Recognition. Springer, 2009.

[6] Valentyn N. Sichkar, "Fingerprint Identification as Access Control System", International Conference on Industrial Engineering, Applications and Manufacturing (ICIEAM),2018.

Automated Minnesota Dexterity Test for Physiotherapeutic Applications

Harsh Kudtarkar
Electronics And Telecommunications
Thakur College of Engineering and Technology
Mumbai, India
harsh.k9815@gmail.com

Anushka Bane
Electronics And Telecommunications
Thakur College of Engineering and Technology
Mumbai, India
anushkabane@gmail.com

Madhul Chand
Electronics And Telecommunications
Thakur College of Engineering and Technology
Mumbai, India
madhul.chand@gmail.com

Dr. Sangeeta Mishra
Electronics And Telecommunications
Thakur College of Engineering and Technology
Mumbai, India
sangeeta.mishra@thakureducation.org

***Abstract* - Dexterity refers to the motor skills which are in the hands of an individual. There are called fine motor skills as well. The dexterity test is an exercise conducted to measure the motor skills in the hands of a patient. The paper mostly focuses on automating the activity by integrating it with an embedded system. For recording the elapsed time during the task, digital timers will be included. Automation will also enhance the variability of the system output and enable additional diagnostics. The existing data recorded for existing activities will be used to generate the relevant normalized results needed for evaluation of tests conducted by this test. This paper also demonstrates the use of standard statistical methods of data analysis to create a new set of data relevant with the device parameters.**

Keywords - Dexterity, Hand movements, MMDT, Placing, Turning.

I. INTRODUCTION

In our day-to-day life activities, we need co-ordination of hand, eye and co-ordination of various parts. To carry on our essential task smoothly co-ordination is necessary. The most important part of the body is the hands. It helps us grasp object. We learn these activities as we grow up and it requires years of practice for it. Human dexterity plays an essential part for hand movements. Dexterity helps us to improve our hand movements and make them better. Under controlled conditions, the Dexterity Test measures the precision of hand and finger movements. Minnesota Manual Dexterity Test (MMDT) is a test with two patterns. MMDT helps in focus on dexterity and fine motor skills and helps to improve them.

Physiotherapists typically use the Dexterity test to create patient recovery plan and to assess the success of their services. They can help to recognize and diagnose certain causes of brain injury, identify learning disorders based on neurology, and musculoskeletal disabilities.

II. LITERATURE SURVEY

Dexterity tests such as Minnesota rate of placing and turning were described in the studies performed in the literature. Minnesota Rate of Manipulation—Placing: The examinee is required to place 60 cylindrical blocks in the proper holes as fast as possible. Minnesota Rate of Manipulation—Turning: The examinee must remove the blocks with one hand from the holes, turn them over with the other hand, and insert them in the same holes, going as quickly as possible from block to block. [1]. Due to a fine focus on the methods involved in assessment of physiological aspects of motor movement and hand dexterity, the paper concludes with the factors which are involved in the assessment. Thus, to comment about the interpretation of the results obtained from performing such tests cannot be done. This creates a bottleneck in the automation aspects of the test.

On 64 subjects with normal hand function and 10 subjects reported to have disorders involving fine dexterity, a new instrument that tests the speed of interdigital handling of items by each hand independently was tested. Testing proceeded from one subtest to another without a rest between test [2]. The speed of interdigital manipulation may be unstable over time due to a learning effect or other unknown factors. The subjects all lived in the Los Angeles metropolitan area; the data gathered might not be generalizable to those living in other geographical areas reliability was assessed with a nondisabled population. Finally, the sample was small, which increases the likelihood of sampling error and decreases the power of the statistical tools.

The Functional Dexterity Test was created as a measure of dexterity that has to be administered for a minimum period of time, but includes details about the patient's ability to use the hand for normal tasks that include a 3-

jaw chuck between the fingertips and the thumb. The doctor instructs the patient to turn over all the pegs with the non- damaged hand starting at the top (away from patient) at the opposite side of the row. The test is then performed twice, first with the non- injured hand followed by the injured hand [3]. No test or measure can capture the total array of impairments of a patient's hand performance, and consequential disability and limitation in participation in all societal activities. Most dexterity tests rate, which is an important component of dexterity; however, as Marcus warned, dexterity is a measure of how easily an individual can perform a task and not whether a person can perform a task. Certain practical steps should complement most of the dexterity tests.

To accomplish the study goals, four separate test protocols were used. First, with a satisfactory sample of 35 subjects were chosen from the total sample, the test-retest reliability of the MMDT was calculated. Secondly, to compare the two related MRMT and MMDT (Placing Test and Turning Test) subtests, 44 samples from the study were tested with the two tests conducted on the same day in random order. Third, in order to check the simultaneous validity of the MMDT, the Box and Block Test, the Purdue Pegboard and the MMDT. In order to enhance morale and competition, each subject in this study was tested on its own [4]. Further testing may create new data about unknown causes of deterioration of motor functions and it may be the key at unlocking physio- therapeutic activities and cybernetic arms.

Two situations have been enforced in this system: standby and evaluation. The standby scenario is a forest in which 2-inch cubes travel close to the user for interaction. The user can move easily and can grasp any cube. For the user to become comfortable with grasping virtual objects, this standby scenario can be helpful. The primary scenario depending on the assessment stage is the BBT box, a black button, various information display panels, and a clear-grey table [5]. The disadvantages of VR can be eliminated by augmented reality (AR), wherein we could use smart phone application to create the virtual environment while highly simplifying the construction of the kit. Slow processing chip would be the bottleneck for this system.

The machine automatically detects the two sides of the box, blocks the boxes inside, and then grades the reports that can be transmitted remotely to the doctors' office. The device also offers supplementary information for clinicians to carry out more outcome evaluations of the patient, such as hand gestures, speeds and locations. In this paper, we discuss the role of the technology, how it improves the current practice, and describe the system implementation and future directions [6]. The system can be applied for other manual dexterity tests and similarly automated. Machine learning may even improve the diagnosis and precision and may also create new insights in diseases related to human dexterity.

III. SCOPE

In much of our everyday tasks, our hands are centrally active. It is typically an almost effortless task to search for objects and grab and control them. Even if these activities simple at first glance, they require many years to learn right from childhood. This activity steadily increases in complexity when we start integrating tools in our day-to-day life. Thus, evaluation of human dexterity becomes an essential part in areas like physical therapy, occupational therapy, vocational therapy, pre-employment screening, evaluation of degree of disability, etc. The automation of the activity will provide more opportunities at new activities and evaluation methods along with time saving benefits and more intuitive such that the activity can be carried out without external supervision.

IV. METHODOLOGY

The proposed methodology for this paper is design research methodology. By identifying the problems in the existing architecture, various objectives and goals are defined for the design and development of the Automated Minnesota Dexterity Test. The design process undergoes a wide range of iterations until an acceptable design tolerance is obtained. The later phase involves the demonstration of the test on sample sets and evaluating the results obtained.

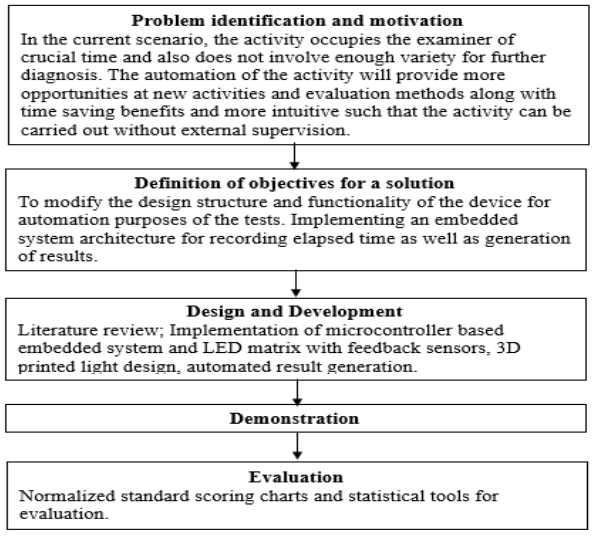


Figure 2: Flowchart of methodology

V. PROPOSED ALGORITHM

In this work, a 4x4 kit is prepared as an activity to be performed by the patient. The kit has 16 slots and also 16 pegs which has a LED above each slot. In total there are 14 patterns where 7 are unique patterns also there are 2 variations for each pattern. The first variation is that the preceding LED will stay on for the duration of the activity. The second variation is such that the preceding LED will turn off for every next state of the activity. There will be 2 methods i.e.,

a) Minnesota Rate of Manipulation—Placing.

In this method, the examinee has to place the pegs according to LED pattern within a given period of time.

b) Minnesota Rate of Manipulation—Turning.

In this method, the examinee has to pick up the peg from one hand and turn it over from the other hand and place it again into the slot within a given period of time.

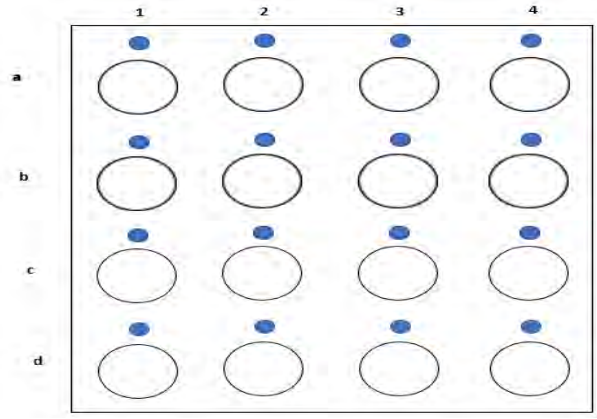


Figure 3: Geometric diagram of 4x4 kit.

Implemented Activities are mentioned:

1) Horizontal pattern:

a1 a2 a3 a4
b1 b2 b3 b4
c1 c2 c3 c4
d1 d2 d3 d4

2) Vertical pattern:

a1 b1 c1 d1
a2 b2 c2 d2
a3 b3 c3 d3
a4 b4 c4 d4

3) Diagonal pattern:

c1 b2 a3
d1 c2 b3 a4
d2 c3 b4

4) Square pattern:

a1 a2 a3 a4
b4 c4 d4
d3 d2 d1
c1 b1

5) 'N' pattern:

d1 c1 b1 a1
b2 c3 d4
c4 b4 a4

6) 'Z' pattern:

a1 a2 a3 a4
b3 c2 d1
d2 d3 d4

7) The last pattern will be **random**.

Block diagram:

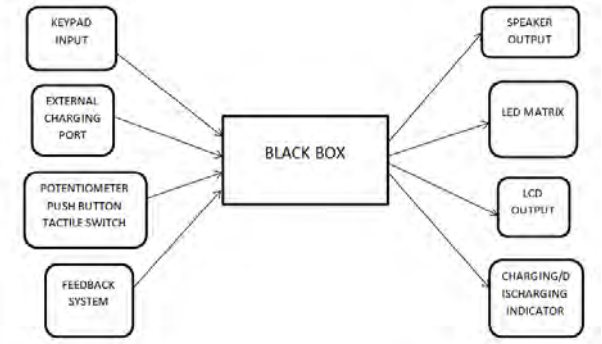


Figure 4: Black box diagram for automation system

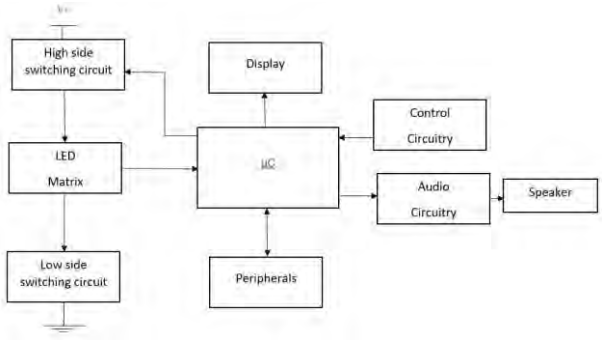


Figure 5: Microcontroller and its related peripherals for sensing and outputs

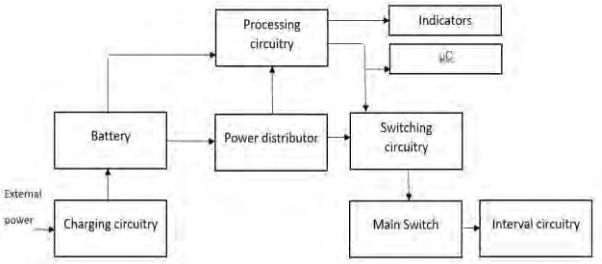


Figure 6: Power circuit block diagram

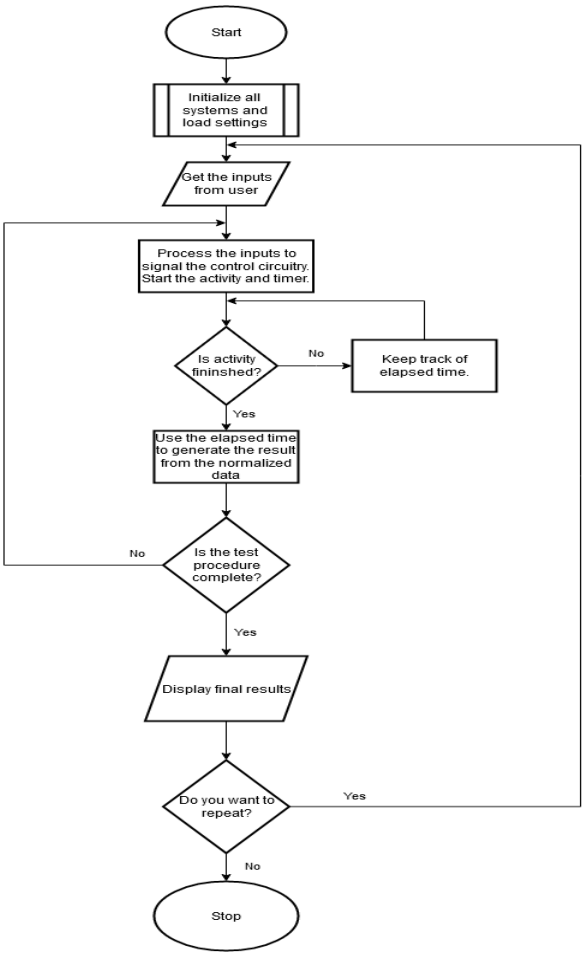


Figure 7: Proposed Flowchart

VI. RESULT AND DISCUSSION

Method of calculation:

For analysis of the test, there was total sample size of 900 and sub sample of 300 each. The ratio of sub sample size was 1:1 i.e., 150 men and 150 women. The majority of men and women were engaged in different occupations. It was divided into 3 groups according to age. First group was between 18-30 years, second group was between 31-60 years and the last group was 61 and above. Among them 96.1% were right hand dominant and 3.9% were left hand dominant. Subjects with disorders were excluded from the test. The MRMT kit was used to evaluate manual dexterity. The test kit is a wooden rectangular peg board with 60 color coded pegs. The 60 pegs are arranged in 15 columns and 4 rows. It consists of 3 subtests i.e., placing, turning and displacement. There will be one practice and two repeat tests where the average of the scores is taken.

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS). Differences in manual dexterity scores between the three age groups were compared using one-way analysis of variance adults,"

(ANOVA). Subject demographics were presented with frequency distribution, mean, and standard deviations wherever appropriate. Decrement of manual dexterity with advancing age was presented graphically. Differences were considered significant at $p<0.05$ for all analyses [7].

Expected Outcome:

There is an LED matrix in the system. High side switch and low side switch are responsible for controlling each and every LED in the matrix. The pegs will contain an element to create a feedback with the system. All the data available will be provided in the display [7].

VII. CONCLUSION

Correlation analysis revealed that with increasing age, participants took longer time to complete the MRMT test r=0.708. To summarize, while age had a detrimental effect on manual dexterity, no association was noted between MRMT scores and gender and occupation. Normal distribution is represented by mean and standard deviation. By using these values, we can extrapolate other values or we can use live examples [7].

REFERENCES

[1] Edwin A. Fleishman and Gaylord D. Ellison "A Factor Analysis of Fine Manipulative Tests," Journal of Applied Psychology 1962, Vol. 46, No. 2, 96-105.

[2] Carol Stein and Elizabeth J. Yerxa "A Test of Fine Finger Dexterity," The American Journal of Occupational Therapy June 1990, Vol. 44, No. 6.

[3] Dorit H. Aaron and Caroline W. Stegink Jansen "Development of the Functional Dexterity Test (FDT): Construction, Validity, Reliability, and Normative Data," Journal of Hand Therapy January-March 2003.

[4] Johanne Desrosiers, Annie Rochette, Rejean Hebert and Gina Bravo "The Minnesota Manual Dexterity Test: Reliability, validity and reference values studies with healthy elderly people," Canadian Journal of Occupational Therapy December 1997, vol. 64, issue 5.

[5] Edwin Daniel Ona, Jaime A. Garcia, William Raffe, Alberto Jardon and Carlos Balaguer "Assessment of Manual Dexterity in VR: Towards

a Fully Automated Version of the Box and Blocks Test," Digital Health: Changing the Way Healthcare is Conceptualized and Delivered 2019, Vol. 266.

[6] Chih-Pin Hsiao, Chen Zhao and Ellen Yi-Leun Do "The Digital Box and Block Test: Automating Traditional Post-Stroke Rehabilitation Assessment," 2013 IEEE International Conference on Pervasive Computing and Communications Workshops (PERCOM Workshops), San Diego, CA, 2013, pp. 360-363.

[7] S. S. Rane, A. Paul, and R. P. Mullerpatan, "Reference values of manual dexterity using minnesota rate of manipulation test for Indian

[8] *Hand Ther.*, vol. 22, no. 2, pp. 79–85, 2017, doi: 10.1177/1758998317694474.

Assistive Technology for Deaf and Dumb

Ms. Sushma Mishra
Software Quality Assurance Analyst
Your.MD
Amersham, England, United Kingdom

***Abstract*— One of the most precious gifts of nature to the human breed is the ability to express himself by responding to the events occurring in his surroundings. Every normal human being sees, listens and then reacts to the situations by speaking himself out. But there are some less fortunate ones who are deprived of this valuable gift. Such people, mainly the deaf and dumb, rely on some sort of sign language for communicating their feelings to others. The deaf, dumb and the blind follow similar problems, when it comes to the use of computers. In the era of advanced technologies, where an integral part of day to day life, efforts are required to be aim is to design a human computer interface system that can recognize procedure of gesture is studied in detail in this paper.**

I. INTRODUCTION

To establish a communication or interaction with Deaf and Mute people is of utter importance nowadays. These people interact through hand gestures or signs. Gestures are basically the physical action form performed by a person to convey some meaningful information. Gestures are a powerful means of communication among humans. In fact gesturing is so deeply rooted in our communication that people often continue gesturing when speaking on the telephone. There are various signs which express complex meanings and recognizing them is a challenging task for people who have no understanding for that language. It becomes difficult finding a well experienced and educated translator for the sign language every time and everywhere but human-computer interaction system for this can be installed anywhere possible. The motivation for developing such helpful application came from the fact that it would prove to be of utmost importance for socially aiding people and how it would help increasingly for social awareness as well. The remarkable ability of the human vision is the gesture recognition, it is noticeable mainly in deaf people when they communicating with each other via sign language and with hearing people as well. In this paper we take up one of the social challenges to give this set of mass a permanent solution in communicating with normal human beings. Sign language is categorized in accordance to regions like Indian, American, Chinese, Arabic and so on and researches on hand gesture recognition, pattern recognitions, image processing have been carried by supposedly countries as well to improve the applications and bring them to the best levels

2. 1 Overview:

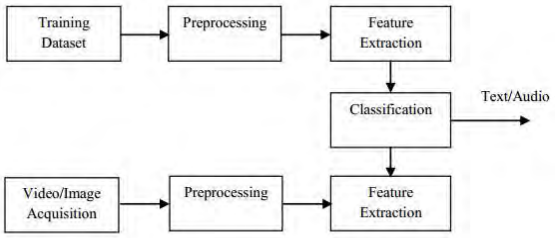


Figure 1. Simple Block Diagram of Sign Language Recognition System

The video sequence of the signer, i.e. the person conveying in the sign language, can be obtained by using a camera. In this work, we consider that the camera faces towards the signer in order to capture the front view of the hand gestures of the signer. Figure 1a shows the description of the image acquisition block of the ASLR system.

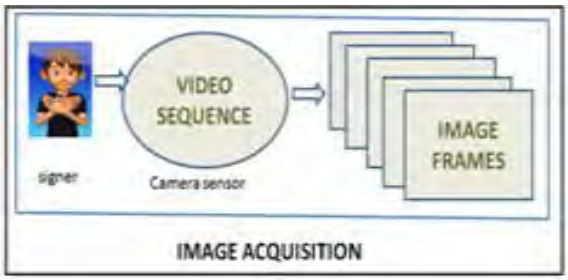


Fig.1a.Image aquisation block automatic sign language recognisation

2.2 Preprocessing:

Local changes due to noise and digitization errors should not radically alter the image scene and information. In order to satisfy the memory requirements and the environmental scene conditions, preprocessing of the video content is highly important. Various factors like illumination, background, camera parameters, and viewpoint or camera location are used to address the scene complexity. These scene conditions affect images of the same object dramatically. The first most step of preprocessing block is filtering as shown in Figure 2. A moving average or median filter is used to remove the unwanted noise from the image scenes. Background subtraction forms the next major step in the preprocessing block.

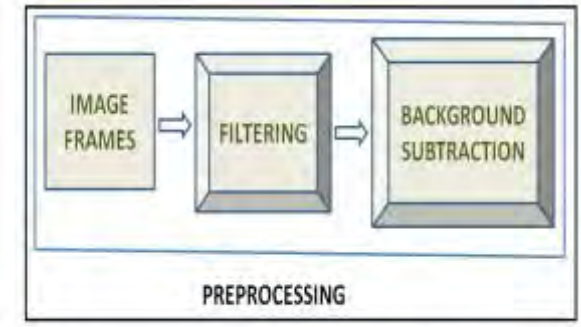


Fig.2. Preprocessing block of the ASLR system design

2.3 Feature Extraction

Under different scene conditions, the performance of different feature detectors will be significantly different. The nature of the background, existence of other objects (occlusion), and illumination must be considered to determine what kind of features can be efficiently and reliably detected. Usually the hand shape and the movement are of major concern in order to guess the word/sentence. The feature vector is a single row column matrix of N elements. The feature vector computation involves time and memory. In general, as the output classes are increased and the nonlinearity of differentiation in the classes increases, more feature vectors are necessary for the object recognition technique.

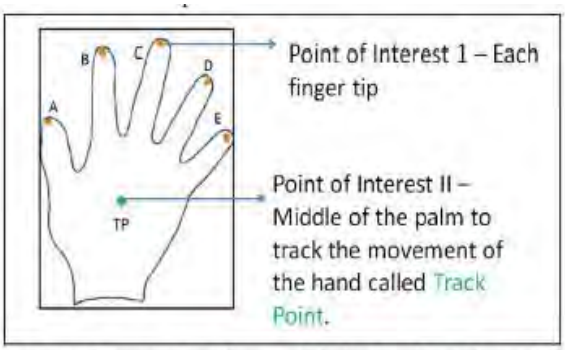


Fig.3. Point of Interest I (Each fingertip of the hand) and II (midpoint of the palm) - POIs.

Features are divided as two sub-categories: hand shape and hand movement. The state of the hand gestures are given by the attributes called Point of Interest (POI) of the hands. We consider two POIs in order to represent the 'shape' and 'direction of movement'. It is shown in Figure 3 both the POIs and their description.

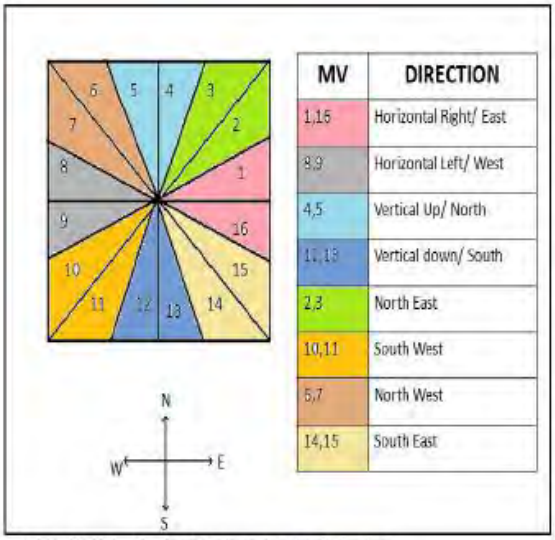


Fig.4.Angle Chart – Motion Vector related to direction.

The finger tips are referred to as A, B, C, D, E points and the midpoint of the hand as Trackpoint (TP) as shown in Figure 3. The motion vector of the TP indicates the direction of motion as an angle lying in one of the cycles of the anglechart as shown in Figure 4.

TABLE I-MOTION VECTOR DIRECTION

Vector Direction from Angle Chart	Angle	Quadrant
1,2,3,4	$0^o - 90^o$	I
5,6,7,8	$90^o - 180^o$	II
9,10,11,12	$180^o - 270^o$	III
13,14,15,16	$270^o - 360^o$	IV

Table I describes the relation between the Motion Vector (MV) direction and the angle chart. Since the angle chart is divided into 16 slots, the motion vector is categorized as one of them. Four bits are used to represent the MV since 16 intervals The feature vector consists of 55 features. These include 5-finger tip elements (A, B, C, D, E, 1 - present, 0- absent), 4-motion vector elements; 6 elements are the MV sequence; and the remaining 40 are from the wavelet transform of the Fourier transformed image of a gesture. The Fourier descriptors are used to outline the shape seen as a closed curve, i.e. sequence of points on the boundary curve. Fourier descriptors are the Fourier transformation coefficients of the object's boundary curve. It is the frequency domain analysis result of the boundary curve, and is one of the method to describe the curve which unaffected by transformation and revolving of the origin of coordinates. The DFT (Discrete Fourier Transform) coefficients are calculated as in:

$$z(k) = \sum_{k=0}^{n-1} p(k) exp\,(j\frac{2\pi lk}{n}) \quad (l = 0,1,\ldots n-1)$$

Where z is the Fourier transformation of p, and it is also the expression of a point sequence in the frequency

domain. p*(k)* is the representation of the object's boundary in a one dimensional space as:

$$p(l) = x(l) + jy(l) \ (l = 0,1,\ldots n-1), \quad j = \sqrt{-1}$$

The MV sequence of each gesture that is trained is unique. Every gesture has a corresponding stored model in the neural network model. Recognition of gesture by gesture is based on a stage where it reaches minimum energy at the end of a gesture. The number of key frames in one gesture varies from man to man due to difference in their speed of action. But the motion vector acts the same way for a unique gesture.

II. RESULTS

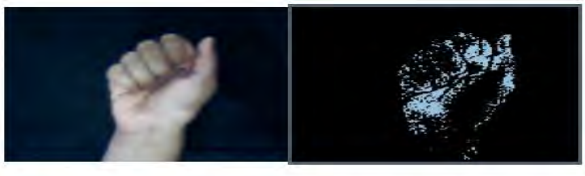
3.1 Database

Database image1 **Preprocessed image 1**

Database image2 **Preprocessed image 2**

Database image1 **Preprocessed image 3**

3.2 Input image



Input image **Preprocessed image 3**

Image	Matching Probability with input image
Image1	0.276486930864962
Image 2	1
Image 3	0.268027969960203

Display Of Image With Maximum Matching Image 2- has the maximum matching probability i.e 1

III. CONCLUSIONS

Thus the objective of the proposed research/project work is to build a system that uses natural gestures as a modality for recognition in the vision based setup. The focus of the proposed project is to develop a Human Computer Interaction (HCI) platform in the context of Indian Sign Language. The development of a system for translating Indian sign language into spoken language would be great help for deaf as well as hearing people of our country. In a country like India there is a need of automatic sign language recognition system, which can cater the need of hearing impaired people. Unfortunately, not much research works on Indian Sign Language recognition is reported till date. The ultimate gain of the proposed system would be enormous. The students will get acquainted with a comparatively latest technology in the form of HCI. Thus it will create awareness about the Language and also enable easy translation. It may also be used as teaching tool in educational institutes for Deaf and dumb also those pursuing professional degrees for translators, interpreters and educators.

IV. FUTURE WORK

Thus, as only one of the techniques of feature abstraction has been implemented till the current stage of execution, the features of abstraction process on bases of dividing the palm and tips of figure a final abstracted image is obtained which is compared with the existing set of images in databases, hence the images are matched across the database and probability of matching is obtained.

REFERENCES

[1] Campbell, J.B,1987.Introduction to remote sensing,The Guildford Press.

[2] Gonzalez ,R.C.,P.wintz,1987.Digital IMAGE Processing.
[3] Steanz,K.1992. A Decade of Imaging spectometory in Canada
[4] Pratt,W.1991 Ditgital Image Processing .John Wiley and Sons
[5] Lillsand ,T.M AND Keifer ,Remote Sensing and Image Interpretation

Breast Cancer Detection Using Genomic Data

Mohit Yadav
Department of Electronics Engineering
Thakur College of Engineering and Technology
Mumbai, India
yadavmohit6100@gmail.com

Rohit Singh
Department of Electronics Engineering
Thakur College of Engineering and Technology
Mumbai, India
09420613901@gmail.com

Hanish Sharma
Department of Electronics Engineering
Thakur College of Engineering and Technology
Mumbai, India
hanish224sharma@gmail.com

***Abstract*—The major challenge faced by healthcare organizations (hospitals, medical centers) is predicting the diseases with greater accuracy and at an early stage. In India more than 50% of Indian women having breast cancer suffer from stage 3 and 4 of breast cancer. We have proposed a system which will predict cancer of patients at its earlier stage by using genomic expression instead of only clinical expressions which will help us to achieve better accuracy. Gene data gives a better advantage since it has the potential ability to indicate cancer at an earlier stage which can be used to train the model more efficiently thus producing overall result more accurately. Different supervised learning algorithms like a highly versatile support vector machine (SVM) algorithm, Naive Bayes theorem, and Decision tree and nearest neighbors approach to predict cancer of the patient are being used here. Using these methods, classification of patients will be done to predict whether a patient is suffering from cancer or not.**

Keywords—Breast Cancer, early prediction, supervised learning algorithms.

I. INTRODUCTION

Over a long period of time, innovation on effective cancer treatment is in progress. Scientists applied different approaches such as screening at an early stage, in order to predict cancer type before the symptoms started to develop. The approach which was used by them was multi omics data via biological data analysis. With the advancement of new technologies in the field of medicine, vast quantities of cancer data have been collected and are available for medical research. These datasets of new technologies are based on genomic data. However, the accurate prediction of a disease at an early stage is one of the most interesting and challenging tasks for physicians.

Here a system is proposed which will predict cancer of patients at its earlier stage by using genomic expression instead of only clinical expressions which will help us to achieve better accuracy. Gene data gives a better advantage since it has the potential ability to indicate cancer at an earlier stage which can be used to train the model more efficiently thus producing overall result more accurately. Different supervised learning algorithms like a highly versatile support vector machine (SVM) algorithm, Naive Bayes theorem, Decision tree and nearest neighbors approach to predict cancer of the patient are being used here. Using these methods, classification of patients will be done to predict whether a patient is suffering from cancer or not.

II. PROPOSED FRAMEWORK

A. Dataset Used

Gene Expression profiling is used in the proposed system. It is nothing but genomic data. It is the measurement of activity of 'n' number of genes at a single point of time to create a thorough picture of cellular function.

A Laboratory tool called a microarray helps in detecting various gene expressions simultaneously. The microscopic slides that have hundreds of tiny spots printed in specific positions are said to be DNA microarrays. Each spot in microscopic slides is known as DNA sequence or gene. The DNA molecules on such slides acts as probes that helps in detecting gene expression. These molecules are also known as transcriptome or RNA transcripts.

B. Algorithms Used

1. **Support Vector machine (SVM) :** The structured support vector machine is a machine learning algorithm that generalizes the Support Vector Machine (SVM) classifier. Whereas the SVM classifier supports binary classification, multiclass classification and regression, the structured SVM allows training of a classifier for general structured output labels.

2. **Decision trees:** are commonly used in operations research, specifically in decision analysis, to help identify a strategy most likely to reach a goal, but are also popular tools in machine learning.

3. **Naïve Bayes:** In machine learning, naïve Bayes classifiers are a family of simple "probabilistic classifiers" based on applying Bayes' theorem with strong (naïve) independence assumptions between the features. They are among the simplest Bayesian network models.

4. **K – Nearest neighbors (k-NN):** It is a type of instance-based learning, or lazy learning, where the function is only approximated locally and all computation is deferred until function evaluation.

III. PROPOSED METHODOLOGY

A lot of recent studies have shown the efficacy of different Machine Learning techniques in the domain of Breast Cancer prognosis or risk factor analysis. We surveyed all the existing systems and their leads. Two subsets of data can allow us to predict breast cancer, Genomic data and Clinical Data. Due to data unavailability and ML models unable to handle high dimensional data,

we restricted our research to determining the risk factor from Genomic data.

We collected data primarily from The Cancer Genome Atlas program. Our final data consisted of normalized Microarray expression values of multiple genes (only main 21 cancer affecting) and their corresponding cancer diagnostic results.

The values of 3 main genes were also analyzed to present the average values of normal patients and diagnosed patients.

Four major Machine Learning algorithms (SVM,Naives Bayes, Decision tree ,K-NN) suitable for our case were implemented on Google Collab using Python 3.8 language and its libraries.

These Algorithms were chosen after considering the dimensionality of data and the type of output expected.

IV. Block Diagram

The designing of the block diagram plays a very important role as it visually describes the system as a whole displaying the significant elements of the system. The diagram below is the block diagram of the project.

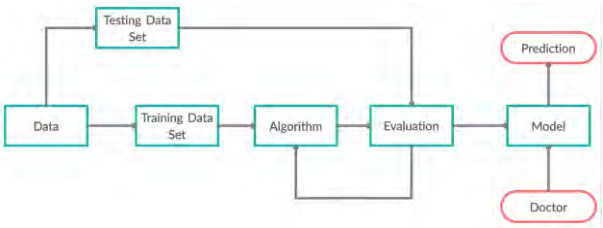


Fig1: Block Diagram

The above block diagram shows that the 80% of the the data collected is used to train the model. The training data is used to check the algorithm accuracy and its behaviour for different data set. Using this the evaluation works as a feedback system which help improve the model. After through training the trained model is made. The Doctor gives the patient input to the model which produces the prediction.The model is ready to be used.

V. Literature Survey

1. "Predicting Cancer Prognosis Using Functional Genomics Data Sets"

Jishnu Das et al. have compared various computational methods that have used different functional genomics datasets. They identify the molecular patterns that can be used for predicting prognosis of various human cancer tumors. Furthermore, they have outlined the challenges and how such approaches can be useful in solving those [1].

2. "Machine learning predicts individual cancer patient responses to therapeutic drugs with high accuracy"

Cai Huang et al. have designed a software platform which predicts cancer from gene expression profiles. They used SVM based algorithm and for regularization they used Recursive Feature Elimination. Their main finding was that the model works best when it uses all probe-set expression profiles of individual patient tumors. They have achieved more than 75% accuracy [2].

3. "Machine learning applications in cancer prognosis and prediction"

Konstantina Kouroua Themis et al. have evaluated all the prominent available ML models. This includes ANNs, BNs, SVMs and DTs. This paper aims to validate the best approaches available so that they can be considered in everyday clinical practice [3].

4. "Predicting stage-specific cancer related genes and their dynamic modules by integrating multiple datasets"

ChaimaAouiche et al. have proposed a structure to identify stage specific cancer related genes by integrating multiple datasets. Also they have built a network by taking each sample pathway as vertices and relationships between genes as edges [4].

5. "Deep Learning Methods for Predicting Disease Status Using Genomic Data"

Qianfan Wu et al. have studied four articles that predicted cancer using genomic expression. These deep learning methods outperformed existing models such as prediction based on transcript-wise screening and prediction based on principal component analysis [5].

6. "Dermatologist-level classification of skin cancer with deep neural networks"

Esteva A et al. used Convolutional Neural Networks to classify skin cancer. They just used skin lesion images and disease labels to train the mode. The model showed great potential [6].

7. "ImageNet large scale visual recognition challenge"

Russakovsky O et al. analyzed the past 5 years of Image classification competition and drew useful patterns and predicted the future development of image classification and its usefulness in disease prediction [7].

8. "A practical guide to support vector classification"

Hsu C-W et al. have explained in detail Support Vector Classification and its potential in disease prediction [8].

VI. Results

- The below image shows the front end ui of the website with 3 selected gene value columns where the gene values are to be given and then finally the submit button to predict.

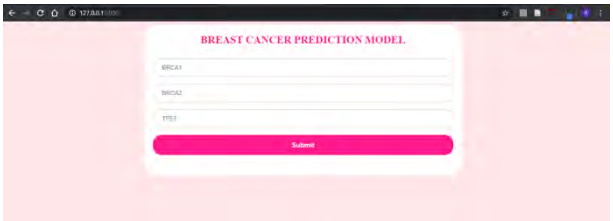


Fig2:UI Model

• We have implemented the SVM model on Weka tool to train the model.

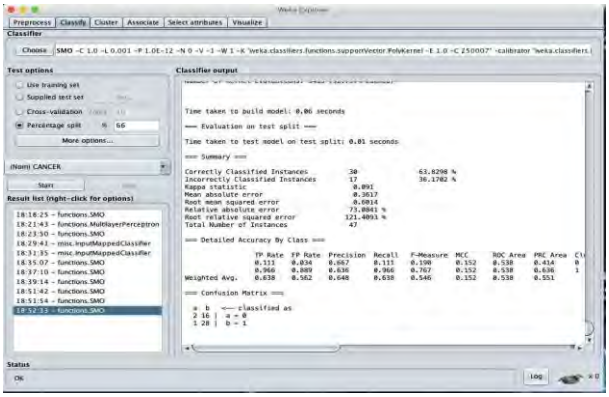


Fig 3 : SVM on Weka Tool

• We have started the decision tree implementation of decision tree on python

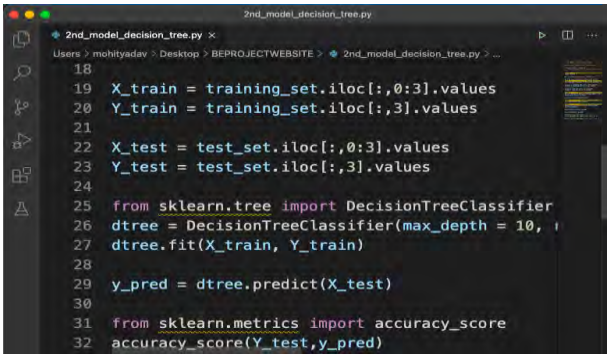


Fig 4 : Decision tree implementation on python

VII. APPLICATION

1. Medical Facilities and Hospitals:

This device can be used at Hospitals and Medical Facilities for early prediction and for high accuracy. As this is a low cost device it has application in rural areas where there are hospitals that cannot afford the cost of large scale equipment.

2. Low cost:

By using genomic data this void can be filled as it helps in early prediction. The microarray gene expression represents the mutation of genes, so if such genes are mutated then chances of tumour growing increases and eventually causing cancer. Thus, due to such microarray gene expression early prediction of cancer is feasible.

3. Early Warning System:

As the early prediction will help to cure the cancer easily and will save money.

VIII. FUTURE SCOPE

In this Application, four machine learning models for prediction of cancer were implemented. However, this is a partial system. For early prediction of cancer, more dimensions of the individual sample may be required. These dimensions can be the lifestyle of the individual, hereditary etc. Acquisition of such dimensional datasets and combining it with gene expression will be the future task and based on such datasets machine learning models can be built.

IX. CONCLUSION

From the above study, it is clear that the cancer prognosis is possible in most cases using machine learning on high dimensional genomic data. Conventional cancer prediction models don't accurately predict cancer at an early stage. By using genomic data this void can be filled as it helps in early prediction. The microarray gene expression represents the mutation of genes, so if such genes are mutated then chances of tumour growing increases and eventually causing cancer. Thus, due to such microarray gene expression early prediction of cancer is feasible.

ACKNOWLEDGMENT

We are grateful to the environment our college “Thakur College of Engineering and Technology” was able to provided for us, in order to complete our project- “Development of Medicine and Food Model Using Obstacle Mapping ”, even in this unprecedented Pandemic. Their constant support, critique and availability is something we appreciate. Our internal Guide Mr. Hemant Kasturiwale never allowed our circumstance to get the best of us and we are thankful to him for imparting many skills to us. Our timely complete is because of the constant support of the internal guide, Our HOD- Dr. S.C. Patil sir and the faculty, who taught us the very basics.

REFERENCES

[1] JJishnu Das, Kaitlyn M Gayvert, and Haiyuan Yu "Predicting Cancer Prognosis Using Functional Genomics Data Sets” Published online 2014 Nov 2. doi: 10.4137/ CIN.S14064PMCID: PMC4218897 PMID: 25392695

[2] Cai Huang, Evan A. Clayton, Lilya V. Matyunina, L. DeEtte McDonald, Benedict B. Benigno,FredrikVannberg, and John F. McDonald, “ Machine learning predicts individual cancer patient responses to therapeutic drugs with high accuracy” Published online 2018 Nov 6. doi: 10.1038/s41598-018-34753-5

[3] Konstantina Kouroua Themis, P .Exarchosab Konstantinos, P. Exarchosa Michalis V .KaramouziscDimitrios, I .Fotiadisab “ Machine learning applications in cancer prognosis and prediction ” Published online doi.org/10.1016/j.csbj.2014.11.005 15 November 2014.

[4] Bolin Chen, and Xuequn Shang "Predicting stage-specific cancer related genes and their dynamic modules by integrating multiple datasets” BMC Bioinformatics. 2019; 20(Suppl 7): 194. Published online 2019 May 1. doi: 10.1186/s12859-019-2740-6 PMCID: PMC6509867 PMID: 31074385

[5] Qianfan Wu, Adel Boueiz,andWeiliangQiu “ Deep Learning Methods for Predicting Disease Status Using Genomic Data” Published online 2018 Dec 11 PMCID: PMC6530791 NIHMSID: NIHMS1024586 PMID: 31131151

[6] Russakovsky O, Deng J, Su H, Krause J, Satheesh S, Ma S, et al. ImageNet large scale visual recognition challenge. Int J Comput Vision. 2015;115: 211–252.

[7] Gaul DA, Mezencev R, Long TQ, Jones CM, Benigno BB, Gray A, et al. Highly-accurate metabolomic detection of early-stage ovarian cancer. Sci Reports. 2015;5: 16351. [PMC free article] [PubMed]

[8] Xie, Haozhe; Li, Jie; Jatkoe, Tim; Hatzis, Christos (2017), "Gene Expression Profiles of Breast Cancer”, Mendeley Data, v1

[9] National Center for Biotechnology Information. Accessed on: Feb 13, 2020. Available: https://www.ncbi.nlm.nih.gov/guide/genes-expression

[10] 10.Breastcancer.org.Accesseson: Feb13,2020. Available: https://www.breastcancer.org/risk/ factors/genetics.

This page is kept blank intentionally

Analysis of Emotional Health using ECG Data Acquisition System

Anshif Thajudeen
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai, India
anshif1000@gmail.com

Prakash Goud
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai, India
goudprakash58@gmail.com

Akanksha Gupta
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai, India
akanksha99.gupta1@gmail.com

Dr. Lochan Jolly
Department of Electronics and TelecommunicationEngineering
Thakur College of Engineering and Technology,
Mumbai, India
lochan.jolly@thakureducation.org

Abstract: **ECG is the measure of the electrical activity of the heart. ECG has some robust features which help largely when subjected to the Machine learning algorithm. ECG of a subject is obtained using the electrodes and Heart rate module. ECGs can be extremely noisy, the Heart Rate monitor acts as an op-amp to help obtain a clear signal. The acquired ECG will then be subjected to python programming to calculate the HRV (Heart Rate Variability) parameters which will act as a benchmark and input for the Machine Learning algorithm. By application of supervised learning algorithms, the output will be in terms of Valence and Arousal values. The Circumplex Model of emotions is used to determine the emotions based on the valence-arousal values, which will be plotted in a four-quadrant graph with each quadrant representing certain emotions.**

Keywords: ECG, Emotions, HRV parameters, Supervised learning, Valence, Arousal, Depression, Mental Health.

I. INTRODUCTION

Humans are emotional beings and exhibit diverse emotions in accordance to the various stimulated actions or the particular environment. Due to advancements in science and technology, it is now possible to detect these emotions through bio-potential signals. In today's world, ECG has far more application then it was previously in the medical field. The abnormalities of ECG and R-R intervals contain information which helps to analyse the emotional status. Determining the emotional state of a human will help in identifying the mental stability.

On an estimate researches believe that more than 70% of teenagers suffer from depression varying from mild to severe. There are numerous causes acting as a stimulant to trigger depression and developing it in the early stage of life is a huge threat. Depression not only affects the brain but the entire body, it indirectly affects the emotional health. As a further matter of fact the negative states of mind exhibited by humans which includes anxiety, loneliness, depression, chronic stress and anger may increase the risk for fatal heart disease over time or even weaken the tissues of the heart the already exist. A person having an emotional state in the positive valence is said to be a stable and healthy minded person and in the retrospect a person having an emotional state in the negative valence region is said to be a mentally unstable person. By detecting emotion, the mental health of the person can be determined and the treatment can be proceeded for the cure.

The approach is to analyse the ECG in order to determine the emotional state of the human subject. The machine learning algorithm is implemented to analyse the ECG by the use of HRV parameters and determining the valence and arousal values. Ectopic beat is basically a disturbance in the cardiac rhythm. It is often referred as the electrical conduction system of the heart. An ectopic heartbeat occurs when the heart either adds an extra beat or skips a beat. They are also referred to as the premature heartbeats

II. LITERATURE REVIEW

Bio-signals are recorded as potentials, voltages, and electrical field strengths generated by nerves and muscles, typically ranging between 1 μV and 100 mV. Hence, the signals need to be amplified in order to process further and gathering the information [2]. Various bio-signals such as EEG, ECG, Respiratory impedance signals and Galvanic Skin response are helpful in recognizing emotions of a human body [5, 7]. Electrocardiogram (ECG) signal largely affects autonomic nervous system (ANS) activities for the duration of an emotional stress changes. These ECGs signals can be divided into by using three different approaches for any research investigations such as: time domain, frequency domain and time-frequency domain. Time-domain analysis usually involves heart rate variability (HRV) which portrays features such as heart rate, R-R intervals, R peak value, standard deviation of NN intervals (SDNN) and root mean square for standard deviation (RMSSD). Frequency domain analysis is performed through spectral analysis such as Power Spectral Density (PSD). Discrete Wavelet Transform (DWT) and Discrete Wavelet Packet Transform (DWPT) are more popular methods in time-frequency domain analysis to extract the features from low frequency (LF, 0.04-0.15 Hz) components and high frequency (HF, 0.16-0.4 Hz) components of ECG signals [1].

Heart rate variability (HRV) defines the fluctuations occurring between the two consecutive heartbeat cycles. This is considered as a highly non-invasive method of

evaluation of cardiac autonomic function. Analysis of these HRV Parameters plays a vital role in emotional detection and identification [7]. The HRV parameters were analyzed by recording ECG of subjects while watching the movie clips inducing emotion. Under negative emotions, it was observed that heart rate was comparatively faster, LF/HF increased relatively, while the fractal dimension plunged, this indicates that the HRV reduces and the sympathetic nerve activity increased while vagus nerve activity decreased [8]. The work in [11] discussed how the HRV analysis using ECG recording could be effective in automatically detecting real-life condition.

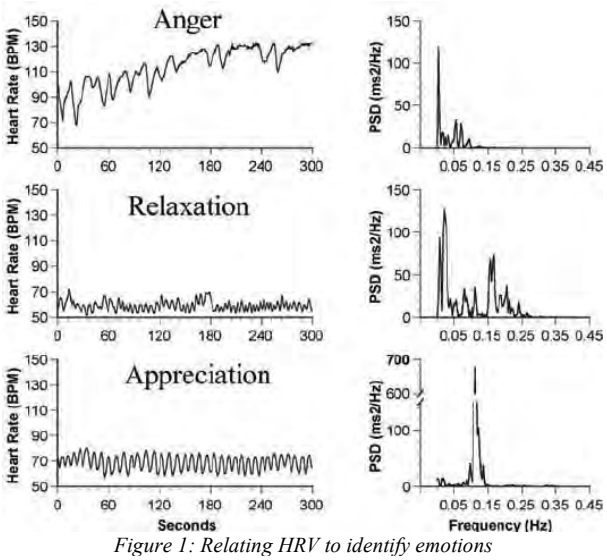


Figure 1: Relating HRV to identify emotions

The Circumplex model of emotion, with axes labelled Valence and Arousal, is suggested in [10] for emotional analysis of using HRV parameters.

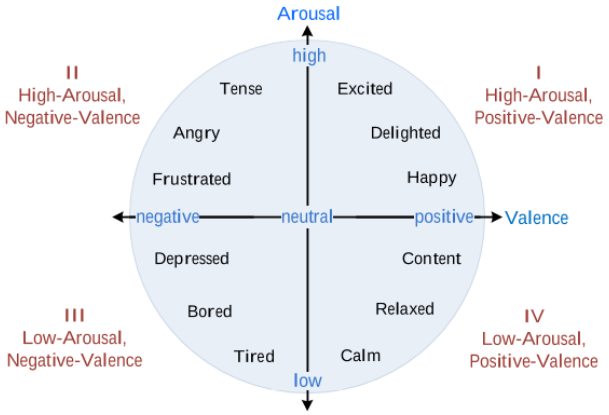


Figure 2: Circumplex Model of emotion

ECG module AD8232 along with Raspberry Pi is used for detection of ECG signal. GUI is created using Python language for visualization of ECG on the monitor [4].In [3], R- peaks detection and Power spectral density is used for determination of distinct cardiac conditions of individuals and their possible heart abnormalities. In [6], the linear SVM is implemented for feature extraction required for emotion recognition. SVM was also employed for classifying the emotion as positive and negative. QRS detection algorithm is used to detect the R peaks from the subjects' ECG. Using the detected R peaks, emotional stress and non- emotional stress is predicted using the K-means Neural Network (KNN) and Support Vector Machine (SVM) algorithm. Accuracy of 75% - 80% was achieved through the proposed method [1]. Logistic Regression (LR) and Artificial Neural Networks (ANN) is compared in [9] for classification of major three emotions (fear, disgust, neutral). With LR classifier, the accuracy achieved in 40% and with ANN classifier, it is 35%.

III. METHODOLOGY

The approach taken in the project is to build system that can take numerical or graphical values as an input and provide the HRV parameters as output which will further be used in machine learning algorithm in order to predict the emotion through valence and arousal.

1. For the input purpose, the numerical values of ECG-time and voltage is provided as an input to the Python programming code. The ECG values are obtained from the open source 'Case data set' available from GitHub.
2. From the ECG values, we obtain the HRV parameters using biosignals notebook library in Python. The HRV parameters include: maximum R-R interval, minimum R-R interval, average R-R interval, beats per minute, standard deviation, power spectral density, power inside ULF, VLF, LF and HF frequency bands, and Number of RR intervals that have a difference in duration, from the previous one, of at least 20 ms and 50 ms. These parameters help in determining the emotional state which can be plotted in the valence arousal table.
3. The obtained HRV parameters are taken for Machine learning algorithm where in the algorithm will predict the arousal-valence values based on the dataset, used for training.

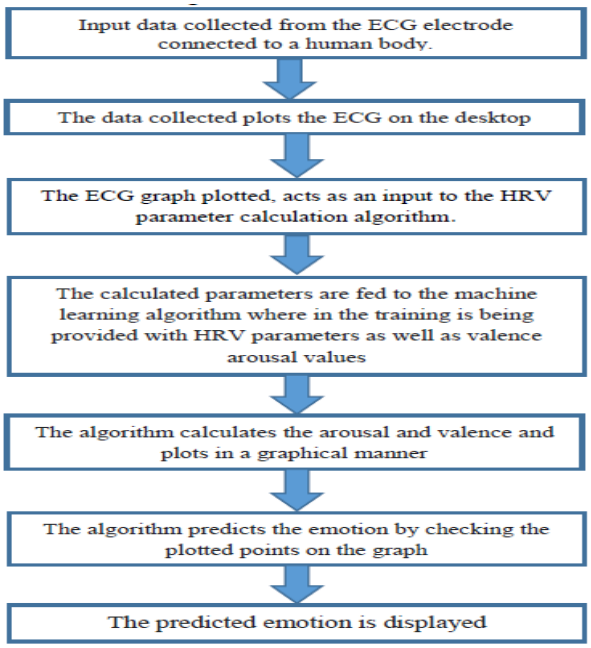


Figure 3: Flow diagram

The following flowchart depicts the process for calculating HRV parameters from acquired ECG signal.

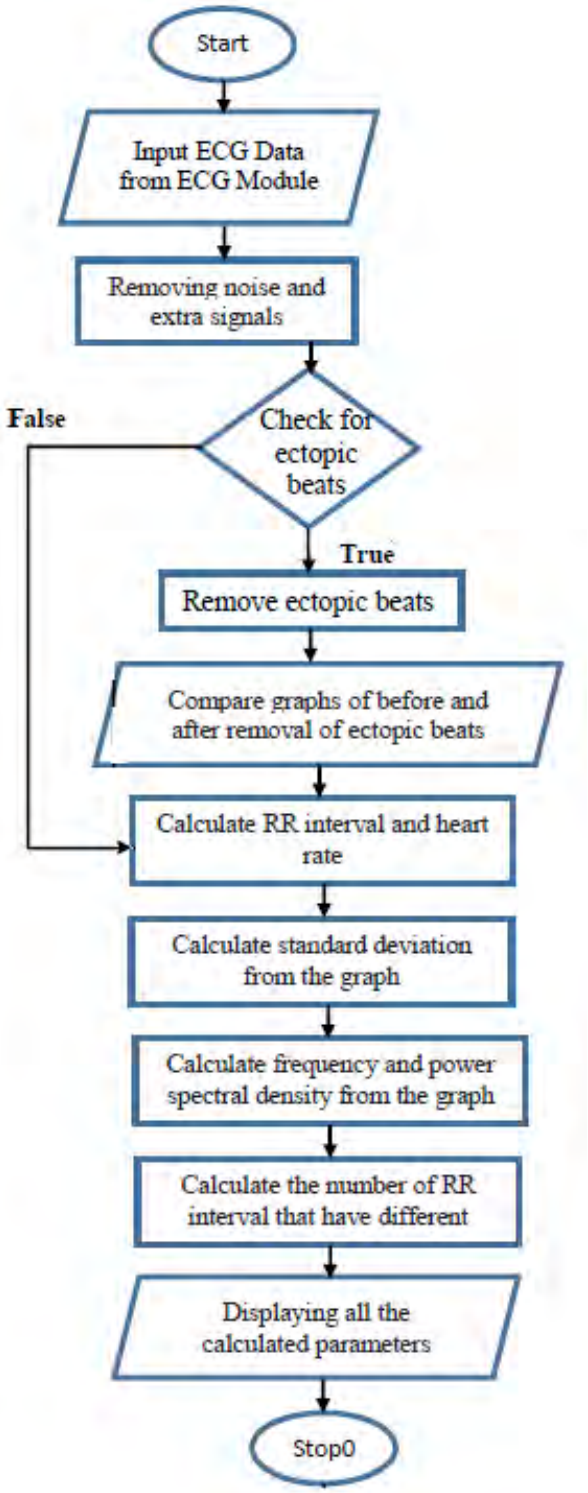


Figure 4: Flowchart of the Program for Calculation of HRV Parameters

Biosignals notebooks Library is used which includes a set of tutorials, that provide programming examples in the form of Jupyter Notebooks and a Python library. This significant and useful collection of code samples has the purpose of helping users, researchers and students interested in recording, processing and classifying biosignals. The examples present on the platform are set on a level of certain difficulty to inspire the users and programmers on the complexity of the task and the how to achieve end result for the same, by reusing and recreating. They also offer pretty diverse method of processing ECG and providing the HRV Parameters from the same. In this Project Case Dataset was taken into consideration to be used with this library for training and testing purpose. CASE (Continuously Annotated Signals of Emotion) dataset: The dataset consists of ECG data from 30 subjects. For the collection of data, the subjects were shown videos for incitement of emotions. The dataset contains the ECG data along with arousal and valence readings taken during subjects were exposed to watching videos. The raw ECG data available is fed to the HRV parameters calculation algorithm. As mentioned in Figure 2. The expected output will be plotted in valence arousal table. Valence describes the pleasantness of an emotional state. Pleasant emotional states are the ones present on first quadrant, such as joy or amusement, are assigned with high valence, while unpleasant emotions on the graph, such as sadness or fear, are associated to low valence with respective arousal value. Arousal displays the magnitude of activation of the particular emotional state basically ranging from inactive (low arousal) which is boredom or sleepiness, to highly active (high arousal) which is excitement or anger. The outputs of HRV algorithm mainly numeric in nature will be applied as input to the machine learning algorithm. The main objective of the machine learning algorithm being to obtain the valence arousal numeric values for output. Here there will be training dataset and testing dataset required to obtain precise output by training the machine. The distribution of the data will be in the ratio of 2:1 basically highlighting that 2 for training and 1 for testing. The algorithm is trained by the case-dataset and the trained machine processes the inputs and gives output as two co-ordinates i.e. valence and arousal. The alogrithms used will be support vector machine, KNN for obtaining accurate output

IV. RESULT & DISCUSSION

The ECG graph was applied to the program. Initially a normal 10 Sec graph was plotted and which the 5 minutes ECG graph was taken to consideration the condensed graph of the same can be observed in Figure 5: Input ECG Image. After this step, comes the HRV Parameters calculation. This can be observed below for 5min ECG Graph. These parameters will be taken into consideration for plotting Valence-Arousal graph.

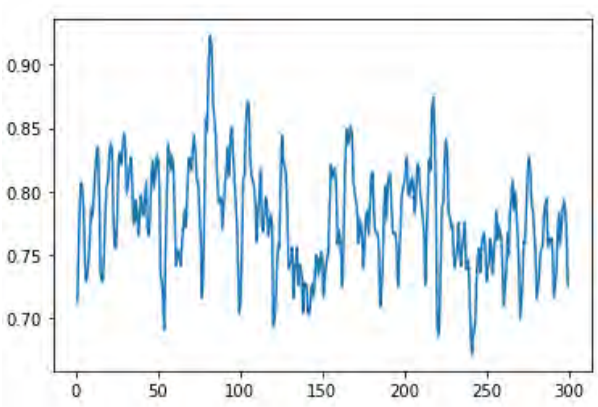


Figure 5: Input ECG Image

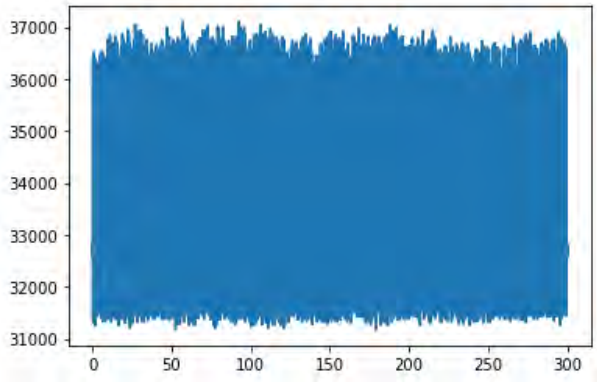


Figure 6: After removal of ectopic beats ECG Wave duration of 5 minutes

Output for HRV parameters:

Table 1: Expected results for HRV parameters

Maximum R-R interval	0.9230030766769346
Minimum R-R interval	0.6710022366741271
Average R-R interval	0.7767506411168555
Maximum Heart rate	89.41847988077431
Minimum Heart rate	65.00520043336859
Average Heart rate	77.24486704475537
Standard deviation	0.041454370839627
SD1	0.016523103999584482
SD2	0.05624870449741531
SD1/SD2	0.293750836525377
ULF Power	0.0
VLF Power	0.00084
LF Power	0.00104
HF Power	0.00014
LF HF Ratio	7.428571428571429
Total Power	0.00200
NN20	139
pNN20	36
NN50	12
pNN50	3

V. CONCLUSION

ECG or electrocardiograph is the measure of the electrical activity of the heart. While normally used to detect the abnormalities in the heart, it does have certain other features that make it more robust as in this case to detect emotions from human beings. Considering this into account, this work detects certain parameters in the ECG signal (numerical values of RR intervals and HRV parameters as discussed above) subjected to an advanced machine learning algorithm and gives the final output which is the emotional state of the subject. The work is completed till the detection and obtaining of numerical values of HRV parameters. Further, the machine learning approach has been decided and will be applied to make it more to make more advancement. The expected output will be plotted in the valence arousal chart displaying the particular emotion of the subject. Identifying the emotions help to determine the mental stability of a person, which will help in deciding the type of treatment required. Apart from that, the prediction of upcoming diseases can be made from the emotional health readings.

VI. ACKNOWLEDGE

Special Thanks to our College Faculties and Principal for providing tremendous support in this project and the GitHub Dataset for Helping us build the Database for Smooth conduction for getting observations in this project.

REFERENCES

[1] Siao Zheng Bong, M. Murugappan, and Sazali Yaacob "Analysis of Electrocardiogram (ECG) Signals for Human Emotional Stress Classification", Communications in Computer and Informatics Science (CCIS) 330, January 2012.

[2] Dr Ganesh V Bhat and Mr. Bhimsen G Tasganya, "ECG Acquisition system", International Journal of Engineering Research and Technology (IJERT), ISSN: 2278-0181, Vol.3 Issue 3, March-2014.

[3] Rashima Mahajan, Dipali Bansal "Identification of Heart Beat Abnormality using Heart Rate and Power Spectral Analysis of ECG", International Conference on Soft Computing Techniques and Implementations (ICSCTI), Track-1: Advanced Computing, Oct 2015.

[4] Ms. Gauravi.A.Yadav, Prof. Shailaja.S.Patil "Raspberry Pi based ECG Data Acquisition System", International Journal of Advance Research in Science and Technology (IJARSE), Vol. 6, Issue No. 4, April 2017.

[5] Xin Liu, Qisong Wang, Dan Liu, Yuan Wang, Yan Zhang, Ou Bai and Jinwei Sun "Human emotion classification based on multiple physiological signals by wearable system", Technology and Health Care 26, DOI 10.3233/THC-174747,IOS Press, 2018.

[6] Jianping Zhu, Lizhen Ji, Chengyu Liu "Heart rate variability monitoring for emotion and disorders of emotion", Institute of Physics and Engineering in Medicine, Physiolosgical measurement, Volume 40, Number 6, June 2019.

[7] Andrius Dzedzickis, Arturas Kaklauskas and Vytautas Bucinskas; 'Human Emotion Recognition: Review of Sensors and Methods'; Sensors 2020, 20, 592; doi: 10.3390/s20030592, January 2020. [8] Chendi Wang and Feng Wang, "An emotional analysis method based on Heart Rate Variability", IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI 2012) DOI: 10.1109/BHI.2012.6211518, January 2012.

[9] Desislava Nikolova, Petia Mihaylova, Agata Manolova and Petia Georgieva, "ECG- Based Human Emotion Recognition Across Multiple Subjects", ICST Institute for Computer Sciences, Social Informatics and Telecommunications Engineering 2019, pp. 25–36, 2019.

[10] Theekshana Dissanayake, Yasitha Rajapaksha, Roshan Ragel and Isuru Nawinne, " An Ensemble Learning Approach for Electrocardiogram Sensor Based Human Emotion Recognition", Sensors 2019, 19, 4495; doi:10.3390/s19204495, October 2019.

[11] Hoang ChuDuc, Kien NguyenPhan, Dung NguyenViet, "A Review of Heart Rate Variability and its Applications", International Conference on Biomedical Engineering and Technology (ICBET) 2013, 2212-6708, May 2013.

An Enhanced System for Restoration and Value Maximization of Images using Prior and Generative AI-Based Models

Disha Revandkar
Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, India
disharevandkar@gmail.com

Shivani Srivastava
Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, India
shivani.sri15@gmail.com

Aanwi Tarihalkar
Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, India
aanwit07111999@gmail.com

Niket Amoda
Electronics and Telecommunication
Thakur College of Engineering and Technology
Mumbai, India
niket.amoda@thakureducation.org

***Abstract*— Deep convolutional networks have become a popular tool for image generation and restoration. Their excellent performance is imputed to their ability to learn from a large number of example images. In this paper we mainly discuss about Generative Adversarial Networks and Deep Image Prior Model based techniques. We elaborate on how unlike generative adversarial networks large image datasets are not required the desired output can be obtained by taking the degraded image into consideration itself. We perform techniques like image inpainting, denoising, super resolution and colourisation using GANs and Deep Image Prior methodology and discuss their shortcomings and advantages.**

Keywords—Convolutional Neural Networks (CNN), Generative Adversarial Networks (GAN), Deep Image Prior, Image Denoising, Image Colourization, Image Inpainting, DeOldify, Super resolution, 3D Image Inpainting, Flutter, AWS Cloud

I. INTRODUCTION

The approach towards image reconstruction problems such as denoising, image super-resolution and inpainting is currently based on deep convolutional neural networks (CNN). Popular approaches for image generation, such as generative adversarial networks (GANs) also use convolutional neural networks. CNNs are generally trained on large datasets of images, so it is usually assumed that their excellent performance is because they learn realistic data priors from examples. Nevertheless, this explanation is insufficient as it can also overfit the same images when labels are randomised. When we studied in detail, it was noted that the power of imagination of GANs is limited. It was summarised that in GANs, the training dataset must have a large number of images so that the network can achieve better results. GANs have less generalisation ability, and the computation time required is very high due to the extensive training dataset requirements. Also, they are susceptible to dataset bias. A GAN that has been trained on multiple dog images can generate a convincing fake image of a dog that might have a different pattern of spots, but it cannot formulate an entirely new animal. Also, the quality of the original training data has a significant impact on the results we obtain. For example, a GAN produced images of cats with random letters integrated on it since the training data contained cat memes from the internet, so the model taught itself that 'words' were part of what it meant to be a 'cat'. Hence, to address this issue, we referred to the remarkable paper "Deep Image Prior" by Dmitry Ulyanov [1] which shows that to solve problems like image denoising, super-resolution and image inpainting the structure of the network is adequate and imposes a strong prior to restore the original output image from the degraded input image. It emphasises that to perform these tasks, pre-trained network or large image datasets are not required and can be performed by considering the degraded image itself. In this paper, we elaborate on techniques like image denoising, super-resolution, image restoration and image inpainting along with state-of-the-art techniques like image colourisation and 3D image inpainting.

II. PROPOSED METHODOLOGY

Many images are often damaged, have a low resolution or are noisy, which dramatically affects their visual quality. These problems can be solved using deep convolutional neural networks. A deep learning neural network has powerful learning capabilities and can extract high-level semantic features. Thus, in this paper, we propose the following techniques using deep learning models:

- Denoising - To recover a clean image from a noisy image
- Image Inpainting - To reconstruct deteriorated or missing parts and pixels of images
- Super Resolution - To generate a high-resolution image from the given low-resolution image
- Image Colourisation - To colourise black and white images
- 3D Image Inpainting - To transform a 2D image to a 3D image

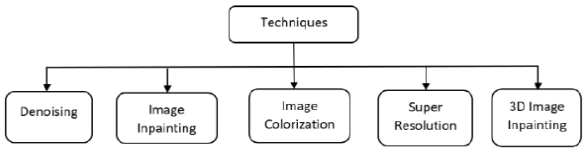


Fig. 1. Proposed Techniques

We also propose designing a user-friendly flutter based android application where the user can feed an input image and obtain the desired output image from any of the techniques implemented. Our trained models will be deployed as backend on Amazon AWS Cloud to facilitate and fasten the outcome process, and the application will serve as front end and communicate with the Cloud.

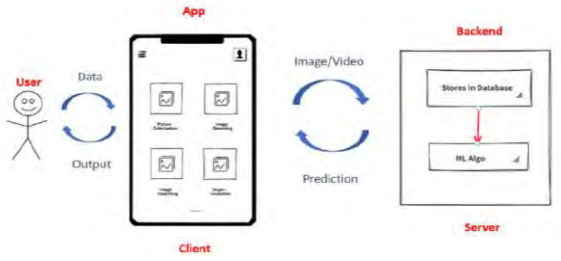


Fig. 2. Application design and System Flow

III. PROPOSED ALGORITHM

A. Image Denosing

Denoising is a technique to recover a clean image from a noisy image. Deep learning techniques have received significant attention in the area of image denoising. However, there are major differences in the different types of deep learning methods that deal with image denoising. Specifically, deep learning-based discriminatory learning will solve the issue of Gaussian noise, and deep learning optimisation models are effective in estimating real noise. In this paper, we elaborate on the technique we have used. As illustrated in Fig. 3. in this technique, we use an hourglass Convolutional Neural Network to generate an arbitrary image having the same dimension as the noisy image. This image is then supervised via a loss function which is basically the Euclidean distance between the noisy image pixels and the generated image. Further, we train the whole network using gradient descent optimisation algorithm since gradient descent optimisation is robust to noise, and the convolution neural network learns image features and spatial patterns on a higher priority. The generated image U becomes the denoised version after 2000 iterations.

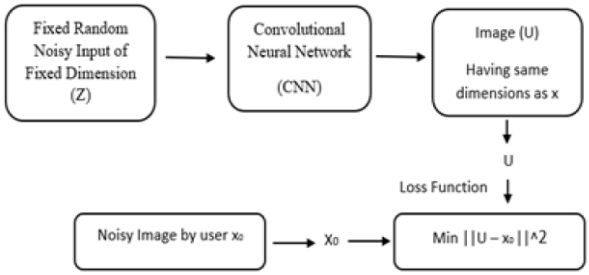


Fig. 3. Algorithm for Image Denoising

B. Image Inpainting

The method of reconstructing missing or deteriorated pixels or data of an image is known as image inpainting. As deep learning technologies progress further, the process of inpainting has become automated. Simply feeding a damaged image to a neural network will provide the corrected output image. Typically, conventional ways of image restoration revolve around some basic concept i.e., if there are gaps in pixels then fill the gap with pixels that are similar to the neighbouring pixels. Such techniques are usually dependent on various factors and are more effective in removing noise or small image defects. They most likely will fail when the image has huge gaps or a significant amount of missing data. In a basic sense, inpainting does not refer to the restoration of missing parts of an image based on the background information. It is a process of filling missing data in a designated visual input region to generate realistic-looking images. GAN is commonly used for different image generation tasks, including image inpainting. Although GANs provide the desired output during our research survey we realised that they learn from large datasets having millions of images thus a pre-trained model on lakhs of images is needed to predict the image and due to this, they are biased towards the dataset on which they are trained on (For example, the skin tone of certain people). Thus, to overcome these drawbacks of GANs, we further studied in detail about Deep Image Prior. In this technique, the generator network structure is sufficient to capture low-level image statistics prior to any learning. In this algorithm, as illustrated in Fig. 5. the user gives input as an incomplete or a masked image and a binary mask that says where the image is incomplete. Fixed noisy input of fixed dimension is passed to a convolutional neural network, an hourglass network. It produces an output (U) whose dimensions are the same as that of the user's incomplete image. This U is subtracted with the incomplete image pixels, and the whole subtraction is element-wise multiplied by the mask, which constitutes our loss function for this task. Then through gradient descent, the whole network is optimised, and the generated output U will represent the true image.

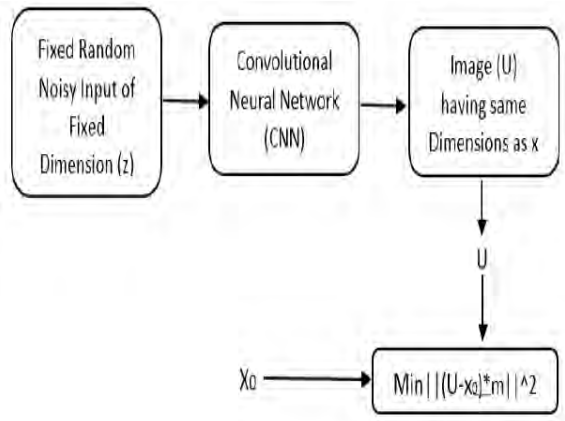


Fig. 4. Algorithm for Image Inpainting

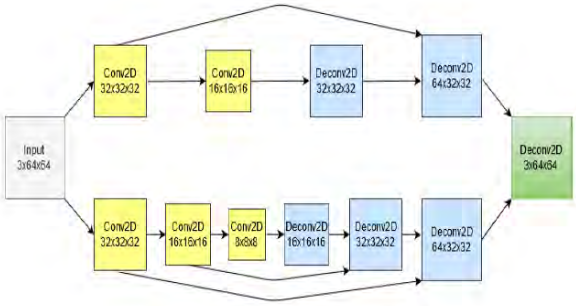


Fig. 5. Convolutional Neural Network Architecture

C. Image Colourisation

Image colourisation is the process of taking a grayscale image input and generating a colourised image output that represents the input's semantic colours and tones. The methodology that we have used for image colourisation is DeOldify. It is an open-source deep learning model used to add high-quality colourisation to old grayscale images. This deep learning model uses a new type of GAN training method called NoGAN. GAN training usually works by training the discriminator and the generator, where the generator begins by being random and improves over time to deceive the discriminator, who tries to determine whether the image is generated or real. The NoGAN method provides the same outcome of the usual GAN training while spending way less time training the GAN architecture, which is typically pretty heavy in computation time. As illustrated in Fig. 4. the training is done by first generating a random image by providing the black and white image as input. The generated image is concatenated with black and white image, and the true coloured image is also concatenated with the black and white image. Both these concatenations are passed through the discriminator one by one. The discriminator here is based on patch GAN so instead of saying outrightly whether a pair of images is the real colour images or fake it predicts on the patches and 70*70 regions of the image separately. Through this discriminator loss, the generator learns to create good quality-coloured images from black and white images.

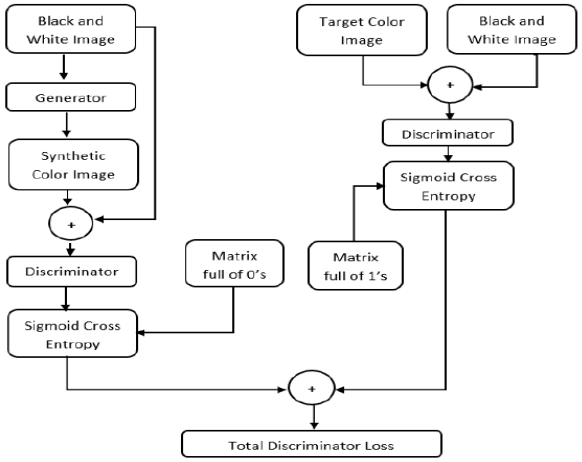


Fig. 6. Algorithm for Image Colourization

D. Super Resolution

Super-resolution refers to the method of producing a high-resolution image from a set of low-resolution images. In our approach, we will use a randomly initialised CNN to upsample the input image using the structure as an image prior. This method does not require any prior learning but produces clearer results equivalent to the GAN based models.

E. 3D Image Inpainting

3D image inpainting is a fascinating way to record and reproduce visual perception. It gives a dramatically more immersive experience than old 2D photography: almost lifelike in Virtual Reality. Our technique suggests a method for converting a single RGB-D input image into a 3D image. A 3D photogeneration is based on the multi-layer representation where these layers contain hallucinated colour and depth structures in regions occluded in the original view. We plan to use a Layered Depth Image with explicit pixel connectivity as underlying representation and present a learning-based inpainting model that synthesises new local colour-and-depth content into the occluded region in a spatial context-aware manner.

F. Application

The application aims to enable users to use these deep learning models without any prior knowledge. Since these models take longer to compute to facilitate and fasten the outcome process, our trained models will be deployed as backend on Amazon AWS Cloud, and the application will serve as front end and communicate with the Cloud. We have designed a Flutter based Android application. Flutter is an open-source UI software development kit created by Google. Users can feed an image as the input and obtain the desired output image from any techniques implemented.

IV. RESULTS

A. Image Denoising

In this technique, the aim is to recover a clean image from a noisy image. For reference, the result of a state-of-the-art denoising approach is shown in Fig. 7.

(a) Noisy input image

(b) Denoised Output Image

Fig. 7. Sample output for Image Denoising

B. Image Colourization

In this technique, we use DeOldify. It is an open-source deep learning model used to add high-quality colourisation to old grayscale images. For reference, the result of an image colourisation approach is shown in Fig. 8.

(a) Black and White Input Image

(b) Coloured Output Image

Fig. 8. Sample output for Image Colourization

C. Image Inpainting

Image Inpainting is a technique for reconstructing lost or deteriorated pixels or data of images and videos. A masked image was concatenated with an input image. For reference, the result of a state-of-the-art image inpainting approach is shown in Fig. 9.

(a) Mask image

(b) Input Image concatenated with the mask image.

(c) Inpainting output image

Fig. 9. Sample output for Image Inpainting

V. CONCLUSION

It was noted that the bias to which GANs were susceptible was mitigated by the use of Deep Image Prior based models. We obtained satisfying results for each technique and are further working on super-resolution and 3D image inpainting. While studying these techniques, we figured that the highly pixelated videos' resolution could be improved by providing features and services like super-resolution and inpainting without the need for high internet speeds. We plan to apply these deep learning techniques to videos and integrate it with video conferencing applications for high-resolution video stream output during video conferencing. The mechanism for the same is simple, the sender sends a reference image, and instead of sending a video stream of pixel-packed images, they send location data of a few key facial landmarks like eyes, nose and mouth. A

generative adversarial network on the receiver's end uses the initial image and a few of the landmarks to reconstruct images and as a result, less data is sent over the network, and high-quality video stream is obtained.

VI. ACKNOWLEDGMENT

Without the exceptional support of our mentor Niket Amoda, this paper and the study behind it would not have been possible. We would also like to extend our thanks to Niket Raut for his valuable insights.

REFERENCES

[1] V. Lempitsky, A. Vedaldi and D. Ulyanov, "Deep Image Prior," 2018 IEEE/CVF Conference on Computer Vision and Pattern Recognition, Salt Lake City, UT, 2018, pp. 9446-9454, doi: 10.1109/CVPR.2018.00984.

[2] I. Goodfellow, J. Pouget-Abadie, M. Mirza, B. Xu, D. Warde-Farley, S. Ozair, A. Courville, and Y. Bengio, "Generative adversarial nets," Neural Information Processing Systems, vol. 3, Montreal, QC, Canada, December 2014, pp. 2672–2680.

[3] Peng Xiang, Lei Wang, Jun Cheng, Bin Zhang, Jiaji Wu "A Deep Network Architecture for Image Inpainting", IEEE Transactions on 2017 3rd IEEE International Conference on Computer and Communications (ICCC)

[4] Huaming Liu, Guanming Lu, Xuehui Bi, Jingjie Yan, Weilan Wang "Image Inpainting Based on Generative Adversarial Networks," IEEE Transactions on 2018 14th International Conference on Natural Computation, Fuzzy Systems and Knowledge Discovery (ICNC-FSKD)

[5] Dahun Kim, Sanghyun Woo, Joon-Young Lee, In So Kweon "Deep Video Inpainting", 2019 IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)

[6] M. -L. Shih, S.-Y. Su, J. Kopf and J. -B. Huang, "3D Photography Using Context-ware Layered Depth Inpainting," 2020 IEEE/CVF Conference on Cmputer Vision and Pattern Recognition (CVPR), Seattle, WA, USA, 2020, pp. 8025-8035, doi: 10.1109/CVPR42600.2020.00805.

[7] LEI ZHOU, WEIYUFENG WEI, "DIC: DEEP IMAGE CLUSTERING FOR UNSUPERVISED IMAGE SEGMENTATION", *ACCESS IEEE*, VOL. 8, PP. 34481-34491, 2020.

[8] N. ZHANG, Y. WANG, X. ZHANG, D. XU AND X. WANG, "AN UNSUPERVISED REMOTE SENSING SINGLE-IMAGE SUPER-RESOLUTION METHOD BASED ON GENERATIVE ADVERSARIAL NETWORK," IN IEEE ACCESS, VOL. 8, PP. 29027-29039, 2020, DOI: 10.1109/ACCESS.2020.2972300.

This page is kept blank intentionally

Online Handwritten Signature Verification using SVM

Romir Dey
E&TC
Thakur College of Engineering and Technology
Mumbai, India
romirdey@gmail.com

Dhrumin Shah
E&TC
Thakur College of Engineering and Technology
Mumbai, India
dhruminshah22@gmail.com

Manoj Chavan
E&TC
Thakur College of Engineering and Technology
Mumbai, India
prof.manoj@gmail.com

***Abstract*— Online signature verification is a method used by banks, intelligence agencies and state-of-the-art institutions to verify personal identity. Signature verification is often used to compare signatures at bank offices and other branch offices. In the proposed method, we used DWT with SVM classifier to verify signature. DWT analyses the signal to different bands often with different resolutions by rotating the signal into approximate speculation. Sub-band decay is used to extract individual features from DWT features to enhance individual signatures. The extracted feature vectors are used to train support vectors that are used as a classifier. Promising research has recently been devoted to investigating the diversity, complexity, and stability of signatures. These features are of great academic and practical value because they highlight the great differences between humans and machines in acquiring, operating and validating signatures, while providing basic information for developing next-generation programs, with high adaptability.**

Keywords*— *Support Vector Machine (SVM), Signature Verification, Handwritten Signature, Discrete Wavelet Transform (DWT), FAR & FRR.

I. INTRODUCTION

There are many biometric methods right now, e.g. Signatures, fingerprints, iris scanning, etc. Fingerprinting and iris confirmation requires the installation of expensive equipment which is why it cannot be used in everyday places such as banks, etc. There is a great deal of interest in verification based on the handwritten verification system as it is the cheapest way to authenticate a person. Banks and government agencies see signatures as legitimate means of verification. Signature verification technology uses different signature features to verify people's identity. Crime experts cannot be hired everywhere so there has been a great deal of effort in developing computer-based strategies that can verify and validate a person's identity. A handwritten signature is naturally attached to someone. Modern document reviewers often compare suspicious signatures with several examples of well-known signatures. They look for counterfeit signals that include: Signatures written at a much slower pace than real signatures; frequent changes of start-up grip; the end of the circle and the beginning; poor line quality by doubting and moving the line; retracing and patching; and stops at places where writing should be free. Compared with other electronic diagnostic methods such as finger scanning and vascular pattern testing, it is easier for people to move from a popular paper and paper signature to a handwritten online signature and computer-certified signature. Most of the time, signatures are not readable even to people. The signature verification problem is therefore concerned with determining whether a particular signature is personal or not. There are two ways signature authentication, online and offline are classified according to how the data is received. In offline mode, the signature is available on paper and scanned later. Handwritten signatures occupy a very special place in these various biometric features. This is because they have made handwritten signatures that are used as a variety of authentication methods. Signatures are often regarded as legal means of ensuring personal ownership of administrative and financial institutions.

The biometric system can confirm or identify. In authentication mode, it verifies a person's identity on the basis of the identity you want. Instead, in the identification mode, it establishes a personal identity (among those registered in the database) without the titles that should claim their identity. Online signature verification is a prominent biometric behavioral feature. Wavelets can be integrated, using a replication process and a whole number called convolution, which contains unknown signal elements (data) to extract data from an unknown signal. Usually, wavelets are designed to have specific areas that make them useful for image processing. In this paper, an online signature verification system using a vector support machine (SVM) is proposed. SVM, a learning approach presented by Vapnik et al. attempts to find a suitable hyperplane to separate the two classes. Therefore, the error of data misclassification in both the training set and the test set is minimized. Basically, SVM is defined by dividing two classes in a row. When data is not evenly distributed, the kernel function is used as a polynomial function, radial base function (RBF) or multilayer perceptron. SVM-based segments include training and evaluation phases. The training phase consists of finding the appropriate parameters Two parameters must therefore be determined: kernel parameter and practice parameter. These two parameters are determined by statistical analysis. The test section allows you to test the strength of the separator.

SIGNATURES RECOGNITION SYSTEMS

Handwritten signatures are divided into two main categories:
Online System:

Data is obtained using a graphical tablet and other electronic devices. A pen and tablet connected to a computer are required to enter the signature details.The On–line approach acquires additional data concerning the signature which has the dynamic properties of signature. . Extract signature data related to many aspects: typing speed, press points, strokes and acceleration.

Offline System:

Signatures are obtained using a scanner or camera, and this signature is taken as an installation image. The purpose of the offline signature verification is to determine whether the signature belongs to the signatory by a scan of a signed signature and other photographs of the signer's original signature. These comprehensive applications provide a computer signature verification program. However, in most programs, the signature image is therefore available; Offline signature verification comes with additional features compared to the online signature verification system. The big problem is that a person's signature can vary according to his feelings, his health, etc. Even a real signatory may not copy his signature as such. In many cases, it seems difficult to distinguish between a genuine signature and a forged signature.

LEVELS OF FORGERIES

Forgeries generally, supported making, forging, or fixing nearly any document, with the intent to different sorts of forgeries are classified into the next categories:

- Random Forgery: this sort formed with none knowledge of the signer's name or the signature shape. The name of the victim is employed by the signer in his own vogue to make a forgery signature called the straightforward forgery or a random forgery. This forgery accounts for the majority of the forgery cases though they're terribly simple to a sight even by the attention.
- Unskilled Forgery: The one that made the signature with their vogue regarding that he hasn't any data of the orthography and knowledge. this may be through with observant the signature closely for associate within enough time.
- Skilled Forgery: There is no doubt that the greatest difficulty in deception is caused by skilled forgers or professional people in the repetition of a signature. To find out this may require searching for or copying a signature in a complex way. Various types of forgeries and related original signatures are shown in Figure 1

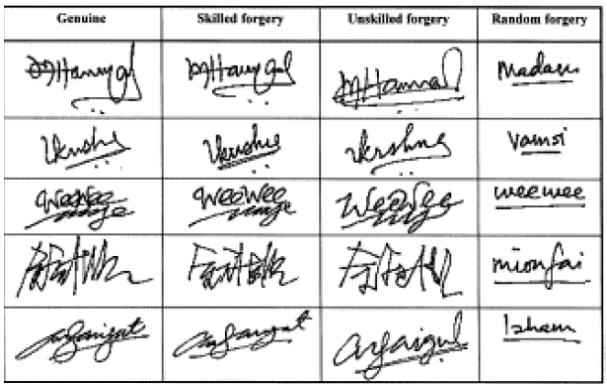


Fig. 1 Types of Forgery

II. LITERATURE REVIEW

There are many methods that used for signature recognition, this section explains some of these methods:

- Fauziyah S., Mardiana B., Zahariah M., Hazura H.(2009) In this system, the development of an online signature verification system using Support Vector Machine (SVM) and VB Tablet 2.0 to validate the signature input by comparing the database. This can be done by signing directly into a computer with a computer connected to a Universal Serial Bus (USB) port, because each person has his or her own way of presenting his or her signatures on paper, there is a certain level of confusion such as how to hold a pen, lashes used in signing and the time / pressure applied to the paper involved in this verification process. Typical online verification procedures are pre-processing, feature extraction, data matching and post processing. The standard verification algorithm is one of the Global Feature Vector Machine (Support Vector Machine (SVM) machines. The signature is characterized as pen-strokes consisting x-y coordinates and the data will be stored in the signature database in the form of a txt.file [4]. This paper involves mainly the use of dynamic information. The error rate used to measure the accuracy and reliability of this software has to be as low as possible and within an acceptable range. Thus, the FAR and FRR has to be low and if possible 0%.
- Christian Gruber, Thiemo Gruber, Sebastian Krinninger, and Bernhard Sick (2009).Here, new kernel function for SVM was proposed and applied to online signature verification. This kernel function measures the similarity of two time series by determining the length of an LCSS. In order to obtain meaningful results, they used a data set with more than 100 test persons, applied some other classifier paradigms on the same training and test data, used a realistic number of genuine signatures to train a reference model, and evaluated several performance criteria. The methodology includes data capture, data acquisition, size normalization, feature extraction and matching image [3]. They

could have used or added more feature extraction techniques to lower the FRR and FAR percentages.

- Emre Özgündüz, Tülin Şentürk and M. Elif Karslıgil.(2005). In this system for each person 8 original and 8 forgery signatures are tested. Possible cases of confirmation of true acceptance (TA), false denial (FR), false denial (TR), false acceptance (FA). In the verification phase 77 similar features are used. They proposed and introduced a new offline authentication and signature process based on international symbols, masks, signature grid and SVM. The training set was designed using a one-size-fits-all approach. The results show that SVM surpasses ANN in both verification and detection processes.Carefully chosen discriminating features of signatures combined with the use of SVM made our system more powerful compared to other existing systems both in terms of success ratio and ease of implementation and optimized run time [2]. Although SVM is better than HMM in many ways as it gives a better result and accuracy. HMM is considered to be better in recognizing handwritten signature.

III. BLOCK DIAGRAM

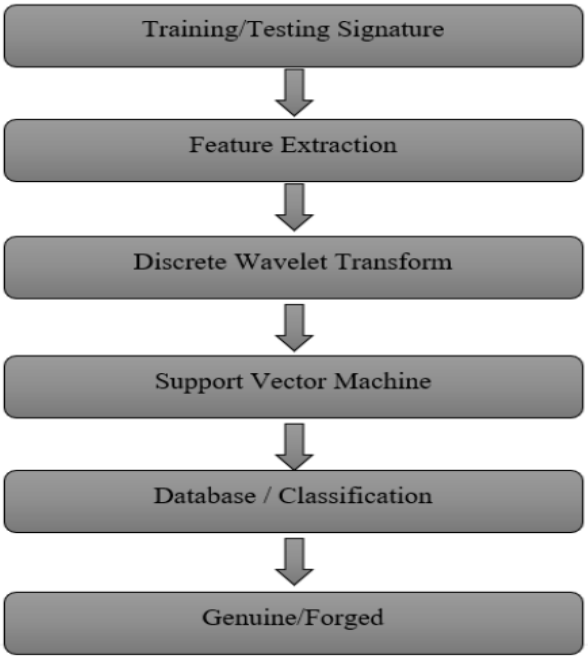


Fig.2 Block Diagram

- Software used: MATLAB
- Datasets: Using SVC2004 datasets
- Normalization using DWT: Size normalization is then applied to the captured data points of each signature.
- Feature Set of Signature: The next task is the computation of feature set of each signature trajectory from the normalized data points of the signature.
- Training and testing: Generate Training and testing using Files
- Verification using Classifier: After training and testing phase here, we will be making use of SVM classifier to identify whether the signatures are forged genuine.

IV. PROPOSED TECHNIQUE

In this project, we have used SVC 2004 dataset. The proposed method is as shown Fig. 2. The proposed online handwritten biometric identification system consists mainly of three phases: Signal modeling, feature extraction, and have matching. The x and y positions of signature points are extracted and every signal is represented as 1D time domain signal. Pressure data points are extracted using graphical pressure pad. It is then used as the third time domain signal. These signals are then normalized and resampled. This is to beat the matter of various sizing and different number of points exists in every signature even for an equivalent user. Discrete wavelet transform is used to extract features from these signals. Sub-band decomposition has been used to extract personality traits from DWT features to strengthen individual signatures. The output vectors used to train the support vectors are used as a separator. In the test phase, signals taken from an anonymous signature are inserted into the output. Leading features are included in the vector support machine separator. The resulting result allows an anonymous signature to be identified if it is a real handwritten signature or not. In summary, two algorithms are very important in a handwritten identification system. The first is the feature removal process (derived from discriminatory information). The second is the separation process (features are used to create a valid signal, corresponding to the appropriate handwritten signature).

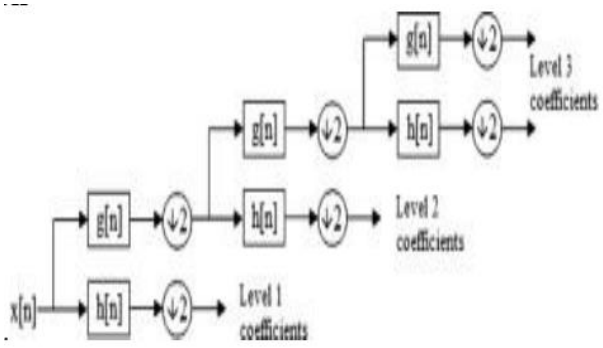


Fig. 3 DWT computation process

The signature database used in this study is the one used in the First International Signature Verification Competition (SVC2004). Handwritten signatures are taken electronically after signing using the PDA. A set of ratings representing the points of each signature is kept during the document. In this case, only x (n), y (n) are used and then, the pressure signature data associated with the handwritten signature is determined. All data is stored in the signature file. The data set utilized in this research contains signature data collected from five users. Each genuine/forgery signature is stored in a separate text file. In each signature document, the signature is just represented as a sequence of points. Examples of user's handwritten signature images created

from both x points and points used in this study are shown in 4. One can see the high diversity of people emerging from these signatures.One also can notice low interpersonal variations appear from a number of these signatures. Examples of handwritten skilled forgery signature images for these genuine signatures are shown in 5.

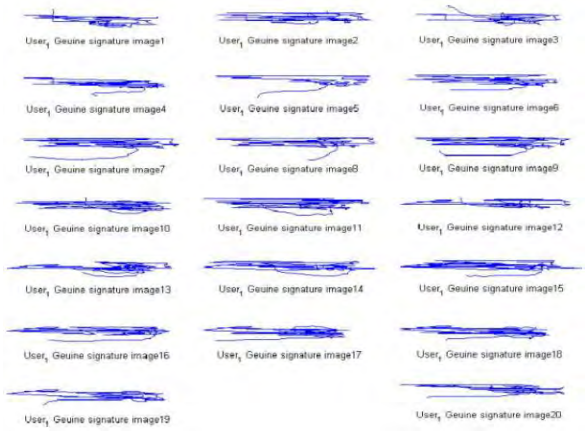


Fig.4: Examples of user 1 genuine signatures

OC-SVM (also referred to as single-class classification or novelty detection) is a training algorithm developed by Schölkopf et al. One-class classification allows classifying just one-class objects, and distinguishing it from all other possible objects. Objects are often classified well by the classifier, but the others are going to be classified as outliers. The concept of the OC-SVM consists to find an hyper sphere in which most of training samples are included in a minimum volume. The main advantage of the OC-SVM lies within the description of an object through training samples. Hence, when a sample is presented to the OC-SVM classifier, it's granted accepted or rejected according the resemblance with the training set, as show in Fig 6.

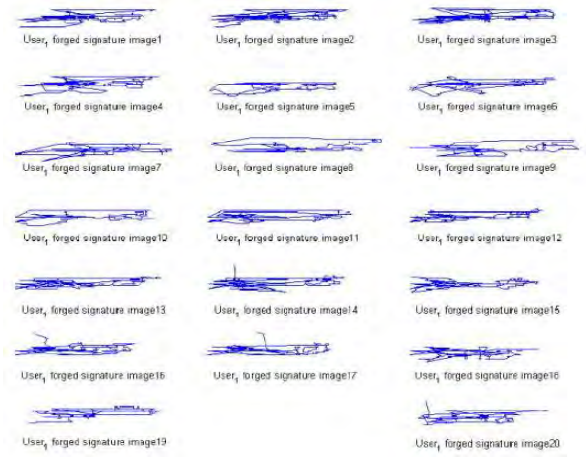


Fig. 5: Examples of skilled forgery signatures for user 1.

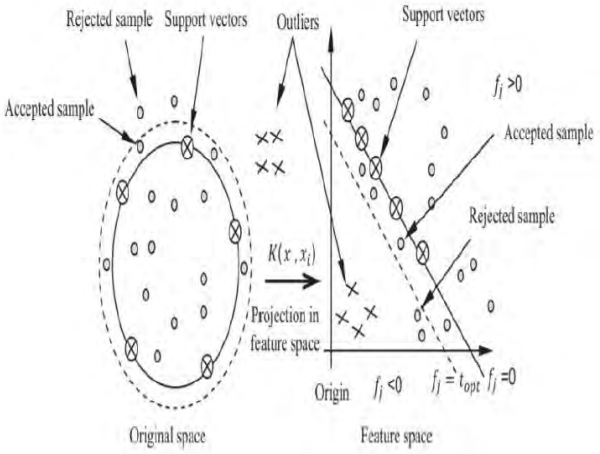


Fig.6: Sample classification based on OC-SVM when training samples are near the hyper sphere

V. RESULT AND DISCUSSION

During the course of this project, we did a thorough study of Biometric systems, Support Vector Machine and formation of Discrete Wavelet transform and how it is useful in image compression through various research papers. Automatic signature verification can produce two types of errors: Type I errors concern the false rejections of genuine signatures [false rejection rate (FRR)]; Type II errors concern the false acceptance of forged signatures [false acceptance rate (FAR)]. Therefore, the performance of a signature verification system is generally estimated in terms of FRR and FAR. Depending on the applications, a trade-off between the two error types must be defined since any reduction of FAR increases FRR, and vice versa. In addition, the equal error rate (EER), which is defined as the system error rate when FRR =FAR, is widely considered to be a measure of the overall error of a system. We are currently working on SVC2004 database, on which we are trying to identify the signatures for which the system fails and to minimize the Equal Error Rate. We are currently identifying the signatures for which the system creates an error and we came to a conclusion that, even the genuine signatures are having errors. So, the expected outcome is to create a system using 1D DWT on the pressure parameter and then working on other parameters for feature extraction using one class approach in SVM for the classification purpose, keeping the FAR – FRR rates as low as possible.

VI. FUTURE SCOPE

We can explore more unsupervised machine learning algorithms which would offer more versatile method of identifying forgery by image processing. These methods may be based on some computational clustering technique and which can be evaluated on the basis of recall and precision values. We can further improve the system by reducing the complexity. The accuracy of classifier can also be enhanced by using more and equal number of training patterns. As the number of input devices and techniques for handwriting acquisition

increases, device interoperability will become an area of greater relevance and need specific investigation. The result of these developments is that signature capture will be feasible in many daily environments by means of fixed and mobile devices, and automatic signature verification will be used in even more applications. ―Soft biometrics, ‖ the deployment of metadata-based systems for large-scale applications, which can expect both multiethnic and multilingual users, is very important and needs specific consideration.

VII. CONCLUSION

This project presents the real time implementation of online signature verification which is interesting field in this world since there is a demand for it. The proposed system achieves accuracy which supports its algorithm, yet the accuracy of the system could be further increased by using different techniques and research and implementation of a generalized system needs to be done. A minimum EER rate will definitely make the system relevant for use in real time applications and will make human life much easier. In the
future, efforts will be made to make the system for reliable efficient. The idea of automatic signature verification using machine learning and understanding the implementation of code to produce a product feasible for real life application will be achieved in the process of making this project.

REFERENCES

[1] Automatic Signature Verification: The State of the Art by Donato Impedovo and Giuseppe Pirlo, Member, IEEE. IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS—PART C: APPLICATIONS AND REVIEWS, VOL. 38, NO. 5, SEPTEMBER 2008.

[2] E. Özgündüz, T. Şentürk and M. Elif Karslıgil, "Off-line signature verification and recognition by Support Vector Machine," *2005 13th European Signal Processing Conference*, Antalya, 2005, pp. 1-4

[3] Christian Gruber, Thiemo Gruber, Sebastian Krinninger, and Bernhard Sick, “Online Signature Verification with Support Vector Machines Based on LCSS Kernel Functions”. *IEEE Transactions on Systems, Man, and Cybernetics—PART B: Cybernetics*, Vol. 40, No. 4, August 2010.

[4] Julita, A. & Salehuddin, Fauziyah & Azlina, O. & Mardiana, B. & Haroon, Hazura & Manap, Zahariah. (2009). “Online Signature Verification system”. *8-12. 10.1109/CSPA.2009.5069177.*

[5] Rohilla, S., Sharma, A. “SVM Based Online Signature Verification Technique Using Reference Feature Vector”. *Proc. Natl. Acad. Sci., India, Sect. A Phys. Sci. 87, 125-136* (2017).

[6] V. A. Bharadi, H. B Kekre (2010) “Off-Line Signature Recognition Systems”, International Journal of Computer Applications 1(27).

[7] S. Nanavati, M. Thieme, and R. Nanavati, Biometrics: Identity Verification in a Networked World. New York: Wiley, 2002, pp. 123–131.

[8] Manoj Chavan, Ravish R Singh, Vinayak Bharadi, “Online Signature Verification using HWT with Hidden Markov Model” in Proc 4th International Conference on Computing, Communication, Control and Automation (ICCUBEA), Pune, India Aug 2017.

[9] MathWorks- MATLAB2014b and Simuli

This page is kept blank intentionally

Adaptive Blending Control Design Based on Soft O_2 Sensor Measurement

Sheng Zeng*
* *Department of Controls Engineering*
Alcon Inc.
Lake Forest, California, USA

Abhijit Barman**
** *Department of Controls and Software Engineering,*
Vyaire Medical Inc.
Irvine, California, USA

***Abstract*- This article presents a soft O_2 sensor design to predict the oxygen concentration in medical ventilation applications. Soft sensor is a technical nomenclature given to the software observer or estimator, used to determine an unknown parameter based on other signals that are available in the form of measurements. In this article, the oxygen concentration level of the gas mixture is predicted using the known oxygen (O_2) flow and air flow measurements. An adaptive blending algorithm design for the appropriate mixing of the air-oxygen mixture is further proposed in this paper based on the designed soft oxygen concentration sensor. The theoretical concepts are implemented and their effectiveness is verified at several oxygen concentration levels.**

Keywords-Medical Ventilator; Blending; Soft Sensor; Oxygen Concentration/FiO2

I. INTRODUCTION

Medical ventilator is routinely used in supportive therapy of critical carepatients and patients with respiratory disorders, which delivers adequate gas exchange that leads to the desired level of oxygenation in the blood, and thereby ensures organ functions [1]. For medical ventilation applications, some of the key variables are sometimes hard to measure in real-time because of the inherent delay in the available sensor technologies. To be specific, the commonly used electrochemical O_2 sensors for biomedical applications have been reported to have significant time delay [2]. Soft sensors provide an effective solution to this quandary, and are especially useful when some of the unknown parameters are difficult to obtain or would have otherwise taken a long time to obtain. Soft sensor is a common name for software where an unknown variable is computed with other signals that can be otherwise measured in real-time. It is sometimes referred in the literature as virtual sensor as well. It has been reported that a model-based soft sensor can be derived if the first principle model describes a system sufficiently accurately [3]. In other instances, missing data do not always show a systematic pattern, or a missing segment might exist in only one of the process measurements, in which cases the missing information can be filled by model-based interpolation methods [4, 5]. The soft sensors found wide applications for continuous emission monitoring devices equipped for NOx, SO_2 and CO_2 for certain large sources, such as industrial boilers and furnaces that could replace costly online analyzers at many plants which could become unavailable due to instrument failure, maintenance or repair. Thus, applications of multivariate soft sensors to emission monitoring have received significant attention from researchers [6, 7]. A data-driven soft sensor, or an inferential model, developed from process observations using a Kalman filter has also been reported [8]. Moreover, robust statistical techniques to develop a systematic framework for soft sensor has also been studied [9].

Soft sensors are particularly important because the predicted parameter can be used for real-time process monitoring and control adjustment. In conventional mechanical ventilator design with blower as the air flow source, high-accuracy oxygen blending is very difficult to implement because the two actuators, namely, the high upstream pressure oxygen flow control valve, and the blower are both single-input and single-output systems with significantly different dynamic characteristics. These two asymmetrical systems, when controlled separately could lead to disproportionate oxygen concentration upon mixing unless there is a system to monitor and control the oxygen concentration in the delivered gas. In this paper, a very simple but effective soft oxygen concentration sensor design is proposed, and an adaptive control approach towards achieving any desired level of oxygen concentration in the delivered air-O_2 mixture is subsequently presented.

II. PROBLEM STATEMENT

In a blower-based medical ventilator, an air blower is normally utilized to generate the air flow, and a high-pressure flow cassette is used to generate the oxygen flow. The mixed gas is delivered into the recipient system airway to maintain desired pressure or flow waveform. Since the blower and flow control valve are two independent and substantially different actuation systems with different dynamic characteristics, a regular PI or PID control design only adds limited poles and zeros to the system dynamics, and it cannot guarantee the consistent dynamic response of the above two servos over a wide operating-range. This inconsistent dynamic response of the O_2 flow and air flow servos would certainly induce flow tracking shifts and add variations, which is moreover compounded by the open-loop nature of the FiO2 control design that causes further FiO2 tracking error. To improve the accuracy of oxygen blending, we intuitively prefer two actuators with identical or at least similar dynamics,

which is rarely the case in practice. Keeping this into perspective, an easier and straightforward approach towards achieving reasonably accurate air-oxygen mixture would be to design a closed-loop FiO2 control. Thus, an adaptive control law utilizing the soft FiO2 estimation is designed to ascertain the accuracy of the oxygen concentration in the gas mixture delivered to the patient airway.

III. Adaptive Control Design

An adaptive control design technique for gas mixture blending in a blower-based medical ventilator is described herein this section. The proposed approach consisting of two steps viz. soft O_2 sensor design and the design of the adaptive control framework to achieve the desired oxygen concentration. These two design steps are outlined in the following subsections.

A. Soft O_2 Sensor Design

Inmany medical ventilator products, the standard approach is to determine the requisiteO_2 flow and the requisite air flow necessary to achieve the desired FiO2 concentration at the patient airway in line with the preset $FiO2_{Setting}$(set from the user settings).These two flow reference trajectoriesthat are essential to maintain the desired pressure or flow waveformscan be derived from the first principles as follows,

$$Q_{o_2}(t) = \frac{FiO2_{setting} - 21}{79} Q_{total}(t) \quad (1)$$

$$Q_{air}(t) = Q_{total}(t) - Q_{o_2}(t) \quad (2)$$

Or

$$Q_{air}(t) = \frac{100 - FiO2_{Setting}}{79} Q_{total}(t) \quad (3)$$

$$Q_{o_2}(t) = Q_{total}(t) - Q_{air}(t) \quad (4)$$

where
Qo_2 is the O_2 flow reference,
$FiO2Setting$ is the $FiO2$ setting from the user's end,
$Q_{air}$is the air flow reference,
$Qtotal$ is the total flow reference, and
$Q_{total} = Q_{air} + Q_{O2}$.

The two flow references shown above are used to individually control the two actuation systems. The fundamental assumption in this kind of gas delivery system is that the two gases would naturally mix and the desired oxygen concentration would be achieved at the patient airway. However, as seen in practice, this is hard to achieve in the real ventilation systems.

Thus, the motivation of this subsection is to design a software estimator for the delivered FiO2 (oxygen) concentration after the mixing. Now, we pose the question that since we have the measurements of the O_2 flow and the air flow, would it be possible to reverse or manipulate the above set of equations (equation 1 through equation 4), to predict the FiO2 concentration. To achieve this objective, we derived anFiO2 concentration estimator (soft sensor) given by,

$$\widehat{FiO2}_{Setting}(t) = \frac{21\int_{t_0}^{t}\hat{Q}_{air}(\tau)d\tau + 100\int_{t_0}^{t}\hat{Q}_{o_2}(\tau)d\tau}{\int_{t_0}^{t}\hat{Q}_{air}(\tau)d\tau + \int_{t_0}^{t}\hat{Q}_{o_2}(\tau)d\tau} + d(t) \quad (5)$$

where
t_0 is initial time instant,
$\hat{Q}_{O_2}$ is the O_2 flow measurement,
$\hat{Q}_{air}$ is the air flow measurement,
$\widehat{FiO2}_{Setting}(t)$ is the FiO2 estimate or soft measurement at any time instant 't', and
d is the lumped disturbances induced by the flow sensor, gas temperature, humidity, etc.

In mechanical ventilation applications, such as in the pressure control mode or basic volume-based modes, t_0 can be considered as the start of inspiratory phase, and 't' can represent the time instant prior to the end of expiratory phase [1].

It is to be noted that the software estimator for the delivered FiO2 (oxygen) concentration discussed thus far is computed at every time instant. In the next subsection, another approach for estimating the FiO2 concentration, which is updated once for each breath instead of updating at each time instant, is presented. The reasoning for the other approach will be also discussed in the later part of the next subsection.

Next, an adaptive control structure for controlling the FiO2 (oxygen) concentration, whicheffectively utilizes the estimated FiO2 concentration as a feedback variable, is presentedin the following subsection.

B. Controller Design

The general objective of this subsection is to ensure the accurate oxygen concentration at the patient airway. This can be accomplished by updating the reference flow trajectories of the blower and O2 flow cassette (flow control valve) adaptively to compensate for the flow tracking variations. Thus, the following proportional controlapproach is proposed to update the two flow references based on the soft $FiO2$ measurement as given below,
Or

$$Q_{air}(t) = \frac{100 - FiO2_{setting}}{79} Q_{total}(t) + k_p \frac{\widehat{FiO2}_{setting}(t) - FiO2_{setting}}{79} Q_{total}(t) \quad (8)$$

$$Q_{o_2}(t) = Q_{total}(t) - Q_{air}(t) \quad (9)$$

where $k_p$is a design parameter.

Note that the flow references above are updated at every time instant. However, the concept of updating the flow references at every time instant has inherent limitations because of the sluggishness of the actuation systems. In other words, the actuators would not be able to compensate for the error for a fast and ever-changing target/reference due to their slow response time.

Based the above discussion on the actuators' response time limitations, another approach of estimating the FiO2 concentration that is updated once during each breath instead of updating at each time instant, is presented. It is to be noted that the user control parameters, such as IPAP (Inspiratory Positive Airway Pressure), EPAP (Expiratory Positive Airway Pressure), inspiratory time, and risetime, determine the desired pressure waveform in pressure control and pressure support modes, or flow waveform in volume modes, and thus the waveform will repeat the same pattern for every breath, either triggered by time or patient effort [1]. Given the repetitive/periodic pattern of the waveforms, another alternative adaptive control law is proposed that uses the soft *FiO2* measurement of the previous breath for updating the flow references namely, the O_2 flow reference and the air flow reference. The soft estimation of the O_2 concentration using the previous breath information can be obtained using the expression given below,

$$\widehat{FiO2}_{Setting}(k-1) = \frac{21\int_{t_{k-1}}^{t_k}\hat{Q}_{air}(\tau)d\tau + 100\int_{t_{k-1}}^{t_k}\hat{Q}_{o_2}(\tau)d\tau}{\int_{t_{k-1}}^{t_k}\hat{Q}_{air}(\tau)d\tau + \int_{t_{k-1}}^{t_k}\hat{Q}_{o_2}(\tau)d\tau} + d_c(k-1) \quad (10)$$

where
k represents the breath instance,
t_{k-1} is the time instant at the start of the previous breath,
$t_k$is the time instant at the end of the previous breath (or alternatively, the time instant at the start of the current breath), and
$d_c$is the lumped disturbance term.

Since $\widehat{FiO2}_{Setting}$(k-1), derived in equation 10, is constant for any given breath instance, this choice of breath-based soft *FiO2* reading is usually preferred over the time-based approach given in equation 5 (outlined in the soft sensor design subsection), where the FiO2 estimate keeps updating at every time instant.

Finally, the control law for appropriate blending of the

$$Q_{o_2}(t) = \frac{FiO2_{setting} - 21}{79}Q_{total}(t) + k_p\frac{FiO2_{setting} - \widehat{FiO2}_{setting}(k-1)}{79}Q_{total}(t) \quad (11)$$

$$Q_{air}(t) = Q_{total}(t) - Q_{o_2}(t) \quad (12)$$

gas mixture using the breath-by-breath adaptation approach is finally designed by modifying the control law given in equations 6 through 9, thereby accomplishing the breath-by-breath update of thetwo flow references based on the soft estimation of the O_2 concentration using the previous breath information (equation 10) as follows:

Or

$$Q_{air}(t) = \frac{100 - FiO2_{setting}}{79}Q_{total}(t) + k_p\frac{\widehat{FiO2}_{setting}(k-1) - FiO2_{setting}}{79}Q_{total}(t) \quad (13)$$

$$Q_{o_2}(t) = Q_{total}(t) - Q_{air}(t) \quad (14)$$

where
kp is a design parameter,
Q_{O2} is the desired oxygen reference trajectory, and
$Q_{air}$is the desired air reference trajectory.

It can be observed that the above set of equations adaptively updates the flow references based on the FiO2 estimate on a breath-by-breath instance as opposed to updating at each time sample.Thus, it makes the controller more responsive to the variations breath over breath.

IV. Results

The two approaches of updating the flow references towards achieving the desired target of FiO2 concentration have been implemented on real-time system hardware using Matlab/ Simulink platform with a sampling time interval of 0.002 second. But as discussed earlier, the time-based approach did not yield sufficient accuracy for the FiO2 concentration because of the sluggishness of the actuators. However, the breath-by-breath adaptation approach demonstrated the effectiveness in achieving the desired accuracy level by controlling the O_2 flow and air flow to track the *FiO2* setting (user setting). For verification tests, the readings of the proposed soft sensor (based on the breath-by-breath adaptation approach and a standard ServoMex oxygen concentration sensor are compared in Table 1 below.
As shown above, the accuracy of the soft sensor was in the range of ±2%, which validates the promise of the soft O_2 sensor and the adaptive control approach described in this technical paper.

Table 1. Test result — Soft O_2 sensor vs. ServoMex

FiO_2 Reference [a]	21	30	40	50	60	70	80	90	99
Soft O_2 Sensor[bc]	20.5	29.34	40.43	49.46	59.46	69.46	79.46	89.46	98.46
Servo Max Sensor	20.5	28.8	38.8	48.5	57.7	67.7	77.7	88.0	98.1

[a] This is the reference command from simulation program.

[b]The initial value of soft O_2 sensor, 20.5, is calibrated based on ServoMex reading.

[c]The reading of soft O_2 sensor is based on equation (5) with $d(t) \equiv 0$.

$$Q_{o_2}(t) = \frac{}{79}Q_{total}(t) + k_p\frac{}{79}Q_{total}(t) \quad (6)$$

$$Q_{air}(t) = Q_{total}(t) - Q_{o_2}(t) \quad (7)$$

V. Conclusion

In this article, we proposed a concept of using soft O_2 sensor to estimate the oxygen concentration in the delivered gas to the patient airway for medical ventilation applications. Soft O_2 sensor uses the existing hardware sensors for flow measurements to predict the *FiO2* concentration of the mixed gas, which in turn provides a cost-effective solution for the blending issues in medical ventilation. The soft O_2 sensor

potentially has much faster response performance than the electrochemical oxygen sensors although the adaptation is performed breath over breath in one of the approaches. Moreover, soft sensor doesn't need maintenance and replacement. An adaptive blending control algorithm is subsequently presented based on the soft O_2 measurement feedback. The algorithm is implemented on a real-time ventilation system with sampling frequency of 500 Hz., and a preliminary test verification results are presented. The accuracy of the soft sensor was in the range of ±2%, thereby demonstrating the promise and effectiveness of the soft O_2 sensorand the adaptive control approach described in this article. In addition, the proposed approach may be generalized to Heliox/O_2 blending for medical ventilation purposes.

ACKNOWLEDGEMENT

We thank Steven Duquette of CareFusion Inc. for granting the permission to carry out this research work. We are also thankful to Vyaire Medical Inc. (formerly CareFusion Inc.) to provide us the resources required to perform the verification tests for this work.

REFERENCES

[1] Chatburn, R. L., "Fundamentals of Mechanical Ventilation: A short course in the theory and application of mechanical ventilators", 1st Edition, 2003.

[2] Ramamoorthy, R., Dutta, P.,and Akbar, S. A., "Oxygen sensors: Materials, methods, designs and applications", *Journal of Material Science,* Vol 38(21), pp. 4271-4282, 2003.

[3] Prasad, V. V., Schley, M. M., Russo, L. P., and Wayne Bequette, B., "Product property and production rate control of styrene polymerization", *Journal of Process Control*, vol. 12(3), pp. 353–372, 2002.

[4] Gupta, A., and Lam, M. S., "Estimating missing values using neural networks", *Journal of the Operational Research Society*, vol. 47(2), pp. 229– 238, 1996.

[5] Nelson, P. R. C., Taylor, P. A., and MacGregor, J. F., "Missing data methods in PCA and PLS: Score calculations with incomplete observations" *Chemometrics and Intelligent Laboratory Systems*, vol. 35, pp. 45–65, 1996.

[6] Dong, D., McAvoy, T. J., and Chang, L. J.; "Emission monitoring using multivariate soft sensors", *Proceedings of the American control conference*, 1995.

[7] Qin, S. J., Yue, H., and Dunia, R., "Self-validating inferential sensors with application to air emission monitoring", Industrial & Engineering Chemistry Research, vol. 36, pp. 1675–1685, 1997.

[8] Joseph, B., and Brosilow, C., "Inferential control of processes", *AIChE Journal*, vol. 24, pp. 485–509, 1978.

[9] Lin, B., Recke, B., Knudsen, J. K. H., and Jorgensen, S. B., "A Systematic approach for soft sensor development", *Computers and Chemical Engineering*, vol. 31, pp. 419-425, 2007.

Phishing Website Detection Using Machine Learning based on URL Features

Gaurang Pandit
Electronics & Telecommunication Department
Thakur College of Engineering & Technology
Mumbai,India.

Dr. Lochan Jolly
Professor
Electronics & Telecommunication Department
Thakur College of Engineering & Technology
Mumbai,India.

***Abstract*— An attempt so as to collect vital sensitive important personal such as OTP, password, CVC number by different ways of mean in electronic information is referred to as phishing. Phishing website appears same as of a legitimate website. It will direct the user to a fake website which appears to be same as original one and try to steal his identity and thus cause damage to the user's information structure. This type of attacks can be detected by using various techniques. Some of the technique include blacklisted technique and heuristic technique. Here in this paper we have tried to use heuristic based technique by making use of URL based features. The model being proposed here has been to demonstrate a very good amount of accuracy which is being close to 98.53% of all the results being tested here.**

Keywords*— *phishing sites, URL-based features, heuristic, machine learning, random forest.

I. INTRODUCTION

With the recent boom in technology internet has become very much a part of very one's life. Phishing is a type of social engineering attack that targets a user's sensitive information through a phony website that appears similar to a legitimate site, or by sending a phishing email [1]. According to research of the Anti Phishing Working Group (APWG), 85,062 phishing sites were globally detected in the second quarter of 2010; by the second quarter of 2014, 128,978 were detected [1]. These figures mark an increase of 1.5 times the value that count of occurred phishing attack in one quarter [2,3]. In addition, there is a huge lose of time as also infrastructure. In terms of economic loss is also being faced. It will have an overall impact on the company revenue in case of corporate world as also on personal level.

In recent times there are many incidents of phishing. Also there have been incident of data theft. All these are the main things that constitute our purpose of study that is phishing. There have been many techniques so as to detect whether the website is phishing or legitimate. The main techniques include the likes of blacklisting and heuristic approach for site detection. The blacklist-based technique maintains a uniform resource locator (URL) list of sites that are classified as phishing sites; if a page requested by a user is present in that list, the connection is blocked [4]. The technique being used is very accurate one and the very commonly used. It has low false negative and false positive rate. Consequently, it has the disadvantage of being unable to detect temporary phishing sites [5]. Phishing fraud leads to malware use of our personal vital details. It can even lead to economic crisis due to leak of banking details such as CVV, OTP details. Phishers make use of phishing site and phishing malwares to do so. They take into consideration at times the problems the user may face while extracting information. The heuristic-based detection technique analyzes and extracts phishing site features and detects phishing sites using that information [6]. In this paper, we tried to overcome the problems faced while using blacklisting approach. The heuristic approach is being used to overcome them. It employs URL features and makes use of different machine learning algorithms. This method or the proposed system at times may be consuming too much time so as to extract the required features. It can help reduce the damage that have been caused so as to overcome the disadvantages of blacklisting methods or procedure required.

II. RELATED WORKS

Phishing is an attempt to steal a user's personal information typically through a fraudulent email or website [1]. We have tried to consider a large of websites. These websites are mainly taken from phish tank. These website include both phishing as also legitimate websites. The legitimate sites are such that there is no need for any checking. They are rather much safe in nature. However the phishing site are main purpose for which we are taken all our study into consideration. They mainly are the one for which the study is being used. This is because from which there are chances of theft identity. These mainly include capturing our sensitivity vital information mainly in the form of CVC. OTP, credit/debit card details. At times there are also chances of gaining access to system and as also to our social networking sites which might also have our some personal information Detection techniques to detect such malicious presence of sites may at times take into consideration the user details and its personal vital info. The techniques have been said to classify into different categories and make use of the features that are being extracted. The extractor does this purpose of URL features extraction If a user requests a site that is included in this list, the connection is

blocked [4]. The blacklist-based approach has the advantages of easy implementation and a low false-positive rate; however, it cannot detect phishing sites that are not listed in the database, including temporarily sites [5].
The heuristic-based approach analyzes phishing site features and generates a classifier using those features [6]. Whenever there is a webpage request from the user the classifier comes into picture it will help to determine phishing nature of the webpage. This is the approach that is being taken into consideration while designing the model which is then being used. It helps to detect phishing sites and temporary at times block such malicious URL based websites. Such an approach helps very easily to overcome the overfitting problems at times.

III. Proposed Approach

A. URL Structure

A URL is being considered as a protocol that will used to give us for the location where the data network is being present.

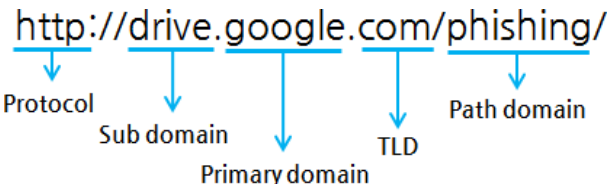


Figure 1. URL Structure.

The URL mainly consist of protocol, sub domain also there is a presence of primary domain and path domain. It also includes TLD. All these components together constitutes what will say or call is URL.
The protocol refers to a communication protocol for exchanging information between information devices; e.g., HTTP, FTP, HTTPS, etc. Protocols are of various types and they are in consideration as and when the features obtained are used to give special character presence. They act as barrier overcoming the required amount of data into consideration.
The subdomain is being the domain to indicate which domain is being present. The TLD is the domain in the highest position in the domain name hierarchy architecture; e.g., .com, .net, .kr, .jp, etc. [7]. Here we have tried to examine all different features. These different features are further then being used to determine whether the website is phishing one or legitimate one.

B. URL Features

Table 1 shows 26 URL-based features that are used in the proposed detection technique.

- Features 1 to 6 are mainly related and considered to Google Suggestion. They mainly return a word whenever there is such a request. The user when requested for a URL it is at such times there is a request to overcome at times to such suggestion. We will try to analyze at such instance whether the request at times be a valid one or not. If at all there is a similar search term. It must always match the features which we have used. This is when we are able to say that there is a legitimate website or not. This is how we are able to say website detection takes place. We use Levenshtein distance between the two terms—the Google Suggestion result and the search term—as a feature for detecting phishing sites [6,8]. In addition, if a suggested result is the same as that of a domain that is present in the trustworthy whitelist, that search term site may be emulating a legitimate site [8]. This is the reason why we are able to have detect such cases at a time whenever there is a user request.
- Features 7 to 9 are extracted so as to help the user determine the main rank of the page. Low rank is indication that the website being used is of low value and is said not to be legitimate in nature. Phishing sites have a very low page rank value or no value because phishing sites are not often visited by many people and they exist for a short time [9]. If at times there are chances that the domain may of low rank value. It is such times and cases that the website user is using is phishing site cause. Features that take into consideration are presence of any special characters. These special characters include @, /, etc. Therefore, patterns of many TLDs in a URL signify a fraudulent site [10]. Therefore, in the above cases, we classify these sites as phishing when and then there is a chance of phishing being used

Table 1.shows URL features

No.	URL-based features	
	Feature name	**Description**
1	Similarity of primary domain and Google Suggestion (primary domain)	Levenshtein distance between primary domain and Google Suggestion (primary domain)
2	Similarity of subdomain and Google Suggestion (subdomain)	Levenshtein distance between primary domain and Google Suggestion (subdomain)
3	Similarity of path domain and Google Suggestion (path domain)	Levenshtein distance between primary domain and Google Suggestion (path domain)
4	Safety of Google Suggestion (primary domain)	Whether result of Google Suggestion (primary domain) is present in the whitelist
5	Safety of Google Suggestion (subdomain)	Whether result of Google Suggestion (subdomain) is present in the whitelist
6	Safety of Google Suggestion (path domain)	Whether result of Google Suggestion (path domain) is present in the whitelist
7	Google page rank	PageRank value of domain
8	Alexa rank	AlexaRank value of domain
9	Alexa reputation	Alexa reputation value of domain
10	Via IP address	Whether domain is in the form of an IP address

Thus, the user URL features at times are very tricky in nature to track the root. At times there are chances that the website we are making use of may be phishing in nature but at times has been considered as legal in nature . It is the measurements or parameters that have to be considered while making such choices. The presence of HTTP or HTTPs. At times the suspicious

character helps the user to determine the phishing nature of website. All these measurements at such cases have been taken into consideration while making such choices and measurements prove to be very true in nature at times. There are also considerations of dots that are being used. A website having too much of dots are considered to have been phishing one. The consideration of dots is also one of the features of feature extraction. The sub domain use also comes into being. the sub domain is calculated on that basis and matched with legitimate website so as to have been determine the nature of website. There are so many machines learning algorithm at times used for the purpose of calculation of sites. They will used as sample dataset. The dataset along with the URL features are used for classification purposes. The presence of IP Address and its similar match are also taken into picture while making use of the characters which are being placed into use while making decisions. The primary domain and the one we are using are matched with google suggestion so as to overcome the required no of matches hence after required. While taken into being the presence of google suggestion which is being considered as in case there are present in the white list or whether they are being blacklisted in that case. The value of page rank are also well considered so as to overcome the phishing cause extraction

C. Architecture

Fig. 2 has been trying to illustrate the proposed model being used here which includes mainly two stages: the training sequence and the detection process.

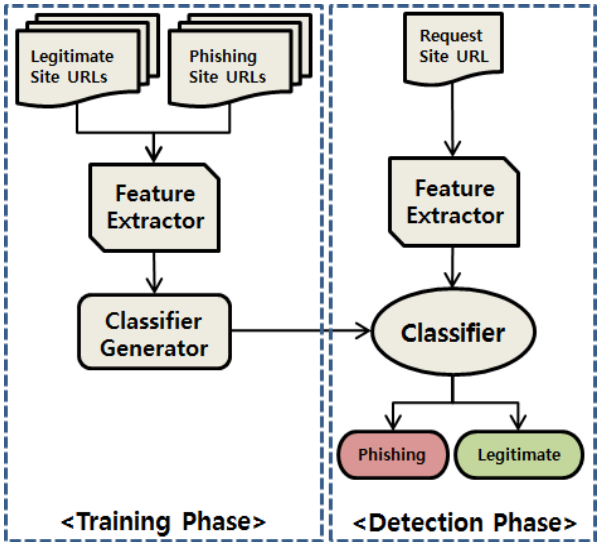


Figure 2. Process of proposed detection method

In the training sequence phase both the website legitimate and phishing website both are taken into consideration as input to features extractor. The feature extractor gives values based on the URL features and taking into relation different aspects of URL features. The features being obtained from feature extractor act as an input for classifier generator. It will take both features and the different machine learning algorithm as an input to give a certain output which will be given as an input to classifier. Here the detection phase whenever there is a request for a certain website from the user will first go to feature extractor which will try to extract various different features based on the URL which ultimately goes to the classifier block. The main aim of classifier is to classify and provide website which are either phishing or legitimate in nature. If the website appears to be a fake one it will alert the user on the basis of classifier that the website is a malicious and help the user from avoiding such fake website

D. Algorithms

To examine the best performance of the system and its ability to detect phishing sites at will we have different machine learning algorithms being used here. Some of those being used extensively for the purpose of detection have been clearly being illustrated here so as to have very good proposed model and have a very good accuracy and efficiency of the system

- Support vector machine are nothing but a classification method that are mainly used whenever there is a user suggestion request. It is such an algorithm that classifies samples on the basis of training samples obtained so. The advantage being is that its capability of learning the samples in high dimensional spaces even in the presence of small sub spaces being present over there. It is also one of classification method which is being able to supervise. It is also very easy to use and helps in classification process. The classification is being done so as to classify methods on the basis differentiation points in different planes. The sub space samples are classified and then able to differentiate on it.

- Decision tree is another classification model being used in the proposed model. It was being first implemented and introduced by Quinlan in 1992. The main purpose of such classification method is the creation of random tree. Hence the name decision tree is given to this algorithm. Decision tree mainly consist of a decision area and leaf node. The purpose of decision area is to check the condition of the samples which have been included in the model. It also then separates them into next decision area as and when required manually. The advantage of using this classification model is that it is very easy to implement and very fast in nature. However one problem arises is of overfitting which may occur while implementing this algorithm. Each node of decision tree corresponds to a feature and the edges thereafter produced separates into each data sample or the sample space as and when required as per the user requesting the site details

- AdaBoost is mainly used for performing the boost of the model being used. They are mainly used rather for ensemble of the process of the system that are being taken into consideration into so called classification

model. In some cases they are commonly known for their discrete and they are said to be considered as discrete in nature Adaboost are mainly used whenever there is a requirement of the classification. It rather does not takes into consideration the classification and does not makes use of regression It can be used to boost the performance of the model. It provides best ensembling and combining the result that are being obtained. It combines the ratio of all used algorithm taking into consideration the best possible machine learning algorithm that can be used so that the best possible. The most suited and therefore most common algorithm used with AdaBoost are decision trees with one level. [10]. The reason why adaboost is used is that it is very and provides best possible results:

$$weight(xi) = 1/n$$

Where xi is the i'th training instance and n is the number of training instances.

IV. Evaluation

To conduct classifier evaluation and training which is being conducted here we have tried to gather information of sites. The study includes taking into account a number of websites. These websites are mainly taken from Phish tank. The study involves 3,000 websites and its details which have been obtained. These details are then being evaluted using k-fold cross evaluation. K-fold evaluation divides the data into cerrtain data set values. These are then being considered for inputs to classifier. The classifier then makes use of it which is then obtained It is then given for detection processes and to detect the site features. This method is typically used to mainly evaluate the accuracy of classifier. It considers only a certain amout of data. The dataset then considered is very much small in nature.The accuracy obtained include true positive (TP), true negative (TN), false positive (FP) and false negative (FN). These are the measurements that help us to detect how much accurate the model and algorithm have been.

		Prediction	
		Positive	Negative
Actual	True	***True Positive***	***False Negative***
	False	***False Positive***	***True Negative***

Figure 3. TP, TN, FP, FN matrix

TP is the ratio whether a phishing site is classified as a phishing one or not. FN helps to determine that phishing site is actually a legitimate legal site. In addition to taking these into consideration TN tells us a determined legitimate website is indeed a one to be legitimate one or not. FP is considered to be truly a legitimate to be classified as a phishing site The result of experiment is such that we are able to obtain TP, TN, FP, FN. These measurement are the one which will help in identifying whether we are accurate enough in classifying algorithm. It will help determine the accuracy of each algorithm which are then used along the URL features. The measurements also include specificity, sensitivity and accuracy of the model. Each of these measurements have very own unique performance measurements which helps in determining the very said parameters of classifier taken into consideration In determining the classifier performance the different equation are being shown here. The first equation is of specificity while second is of sensitivity and the third is of accuracy

$$Specificity = \frac{TP}{TP+FP}$$

$$Sensitivity = \frac{FP}{FP+FN}$$

$$Accuracy = \frac{TP+TN+FP+FN}{TP+TN}$$

TABLE II. TF, TN, FP, AND FN OF MACHINE LEARNING ALGORITHMS

Algorithm	Measurements			
	TP	*TN*	*FP*	*FN*
SVM	97.05%	94.80%	5.16%	3.08%
Decision Tree	96.70%	96.70%	3.12%	3.16%
Random Forest	98.16%	98.40%	1.69%	1.92%

Here the different performance parameters which involves accuracy, sensitivity, specificity are being illustrated. The table also involves the result of different machine learning algorithm being used extensively.

TABLE III. EXPERIMENTAL RESULTS OF ALGORITHMS

Algorithm	Measurements		
	Specificity	*Sensitivity*	*Accuracy*
SVM	96.93%	95.00%	95.95%
Decision Tree	96.90%	96.90%	96.88%
Random Forest	98.10%	98.30%	98.23%

As a result of the experiment being used we are able to say that random forest provides the best accuracy and different parameters being used. The classifier in the case of random forest was successfully being able to detect 98.3% of all the sites being used which mainly involves phishing websites. The high accuracy and low false positive rate that is being showcased here clearly is been able to show us that the proposed heuristic based

url features model is able to quite being detect the phishing site and the legitimate website.

V. RESULTS

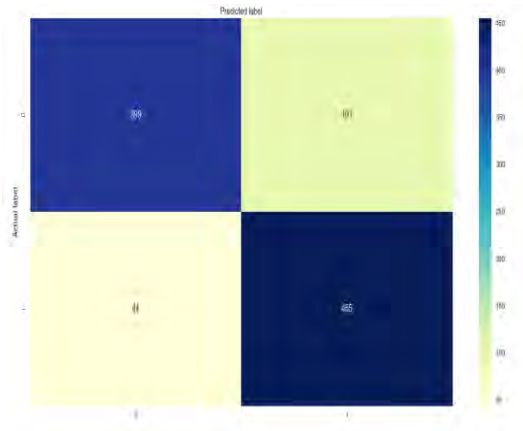


Fig 3 shows confusion matrix

1) The graph has been plotted for actual label versus predicted label.
2) The confusion matrix has been represented. A confusion matrix is used to describe the performance of classification model on a set of test data in which true values are known.
3) It is simple to understand but terminology is confusing. Hence the name confusion matrix has been given to the result. The graph can labeled into true positive, true negative, false positive and false negative.

- True negative: we predicted no and they are not phishing.
- True positive: These are the cases where we predicted phishing and they are phishing.
- False positive: These are the cases where we predicted yes but they are not phishing
- False Negative: We predicted here no but they are actually phishing

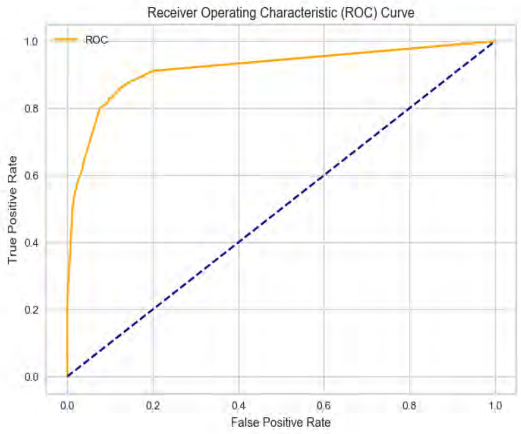


Fig 4. Shows ROC operating characteristic curve

Precision: Precision is the value of correctly phishing classified URls from all the URLs which the classifier tagged as phishing. The formula for calculating precision:

$$\text{Precision} = \frac{\text{True Positive}}{(\text{True Positive} + \text{False Positiv}}$$

Recall: Recall is the value of correctly classified phishing URLs from all the phishing URLs that exists in the dataset.

F1 score: They are used to measure model accuracy while making predictions. It takes into consideration positive and negative values. If the model avoid making mistakes in both phishing and legitimate websites then the model is considered to be having F1 score. F1 score is the balance of both precision and recall. It is used when the prediction made in one class are correct whereas the prediction made during other class goes wrong.

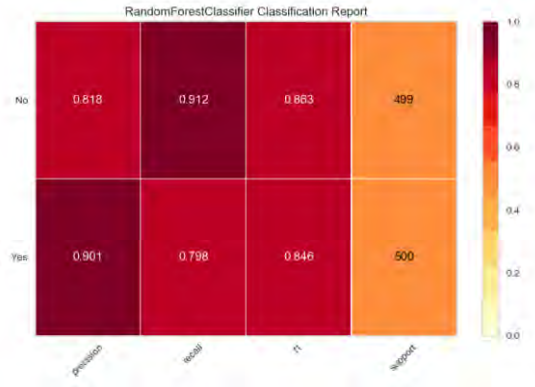


Fig 5 shows classification classifier method

The result report shows Classification of accuracy of model.it shows how much better results can be obtained. It shows its prediction ability. It shows better efficient model can be done. It shows the scale of accuracy in which system is developed and how it evolves. It is very necessary to obtain efficient system. After the requirements have been determined, the necessary specifications for the hardware, software, people, and data resources, and the information products that will satisfy the functional requirements of the proposed system can be determined. The design will serve as a blueprint for the system and helps detect problems before these errors or problems are built into the final system. Professionals create the system design, but must review their work with the users to ensure the design meets users' needs.

VI. CONCLUSION

In this paper we have tried to showcase a heuristic approach for detection of each and every website. It mainly employs URL features which will help in its detection purposes. We have tried to make use of different machine learning algorithm. The method makes use of URL features with addition to certain

more additional features the system becomes best suite and fit for the process and study of site detection. The only disadvantage that might cause a problem includes the time consuming nature of the approach being used. The URL features with these algorithm may at times become time consuming. At conditions where there is time constraint can become very much a problem. This involves the further study and future scope to overcome them.

Future work will involve to overcome the challenges being faced while using the different algorithm. Here after we will try to give more algorithm to classify and propose a very good model which will ensemble and give us a more detailed output. We will try to examine and provide a more proposed features.

REFERENCES

[1] Khonji, Mahmoud, Youssef Iraqi, and Andrew Jones. "Phishing detection: a literature survey." Communications Surveys & Tutorials, IEEE 15.4 (2013): 2091-2121.

[2] Anti Phishing Working Group. (2015. March.) APWG Phishing Activity Trend Report 2nd Quarter 2010. [Online]. Available: http://docs.apwg.org/reports/apwg_trends_report_q2_2014.pdf

[3] Anti Phishing Working Group. (2015. March.) APWG Phishing Activity Trend Report 2nd Quarter 2014. [Online]. Available: http://docs.apwg.org/reports/apwg_report_q2_2010.pdf

[4] Huang, Huajun, Junshan Tan, and Lingxi Liu. "Countermeasure techniques for deceptive phishing attack." New Trends in Information and Service Science, 2009. NISS'09. International Conference on. IEEE, 2009.

[5] Ma, Justin, et al. "Beyond blacklists: learning to detect malicious web sites from suspicious URLs." Proceedings of the 15th ACM SIGKDD international conference on discovery and data mining. ACM, 2009

[6] Nguyen, Luong Anh Tuan, et al. "A novel approach for phishing detection using URL-based heuristic." Computing, Management and Telecommunications (ComManTel), 2014 International Conference on. IEEE, 2014.

[7] Wikipedia. (2015. March) Uniform Resource Loactor. Avaliable: http://en.wikipedia.org/wiki/Uniform_resource_locator

[8] Kausar, Firdous, et al. "Hybrid Client Side Phishing Websites Detection Approach." International Journal of Advanced Computer Science and Applications (IJACSA) 5.7 (2014).

[9] Sunil, A. Naga Venkata, and Anjali Sardana. "A pagerank based detection technique for phishing web sites." Computers & Informatics (ISCI), 2012 IEEE Symposium on. IEEE, 2012.

[10] Mohammad, Rami M., Fadi Thabtah, and Lee McCluskey. "Intelligent rule-based phishing websites classification." Information Security, IETE

Design and Implementation of False Currency Detection using UV Detection and Image Processing

Yash Majalkar
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
majalkaryash07@gmail.com

Abhishek Mishra
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai – 400 101
abhishekmishra02468@gmail.com

Aditi Verma
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East),
Mumbai - 400 101
aditiverma03988@gmail.com

***Abstract*— Fake Currency has always been an issue that has created a lot of problems in the market. The increasing technological advancements have made the possibility for creating more counterfeit currency which is circulated in the market which reduces the overall economy of the country. This proposed system uses Image Processing and UV light to detect whether the currency is genuine or counterfeit. Image Processing is designed completely using the Python programming language. It consists of the steps such as grayscale conversion, edge detection, segmentation, etc. which are performed using suitable methods.**

Keywords—Internet of Things (IOT), currency detection, IoT, image processing, grayscale conversion, edge detection, segmentation, UV sensors, Pi camera, Python.

I. INTRODUCTION

Different countries around the world use different types of currencies for the monetary exchange of some kinds of goods. One common problem faced by many countries related to currency, is the inclusion of fake currency in the system. India is one of the countries that face a lot of problems and huge losses due to the fake currencies. Due to this there are losses in the overall economy of the country 's currency value. The technological advancements have made a pathway for currencies to be duplicated such that it cannot be normally recognized. Advanced printers and new editing computer software's are used to create counterfeit currencies. Fake currencies can just be slipped into bundles of genuine currency which is how they are usually circulated in the market. Commercial areas like the banks, malls, jewelry stores, etc have huge number of transactions on a daily basis and they may face losses especially during bank deposits or transactions. Hence, it is very important to design a system which accurately detects whether the currency is false or not. Using only hardware or only software method is not enough to check the authenticity of thenote. But using both the methods gives accurate results. This system is designed such that any person can use it easily and detect the authenticity of the currency he has by using the visual features of the currency. Taking in consideration of both visible a well as invisible parameters of notes will result in maximum accuracy.

II. PROPOSED FRAMEWORK

Hardware Analysis: Hardware step of this project is the most important part of the analysis. UV detection method is one of the finest and most accurate methods for analyzing and detecting counterfeited currencies. It is known that Indian currencies are coated with a special dye that are visible only in UV light. The output of this process is captured with the help of digital camera which is the important step for the further software analysis.

Fig.1 Hardware analysis using UV Detection and Digital Camera

Software Analysis: Analyzing the counterfeited currencies with the help of image processing is one of the methods. But the accuracy is not up to the mark. In order to increase the accuracy of the system we are embedding two different methods i.e., Hardware analysis and Software analysis. Image processing work with a certain algorithm is explained in fig. 2.

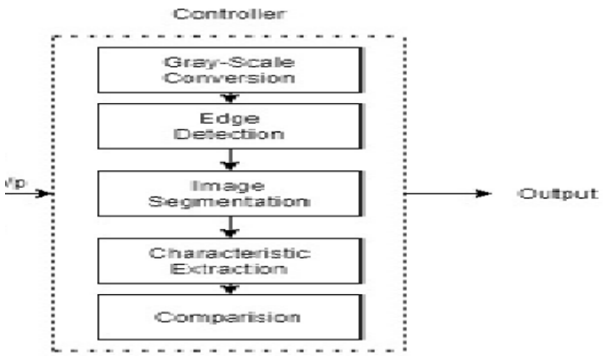


Fig.2 Software analysis using Image processing

III.PROPOSED ARCHITECTURE & METHEDOLOGY

The designing of the block diagram plays a very important role as it visually describes the system as a whole displaying the significant elements of the system. The diagram below is the block diagram of the project.

1. The UV Detection takes an input as a currency, which will be the first and the strongest level of the project. The effect of the UV light on the currency creates a luminous effect on the currency, which will highlight some important parameters of the currency.

2. The effect produced due to UV light on the currency will get captured by the camera, which will be used for further process.

3. The output of the camera is taken as an input by the Micro-controller. Micro-controller is initially programmed with the image processing code and with the other default information which will be required for image processing.

4.The image processing step in the project is very important, as it is used as a software tool to increase the accuracy of the system. Gray scaling and other image comparison part is done in the software part.

IV.DESIGNING MODEL

1.Working of the whole system can be explained with the help of this model as

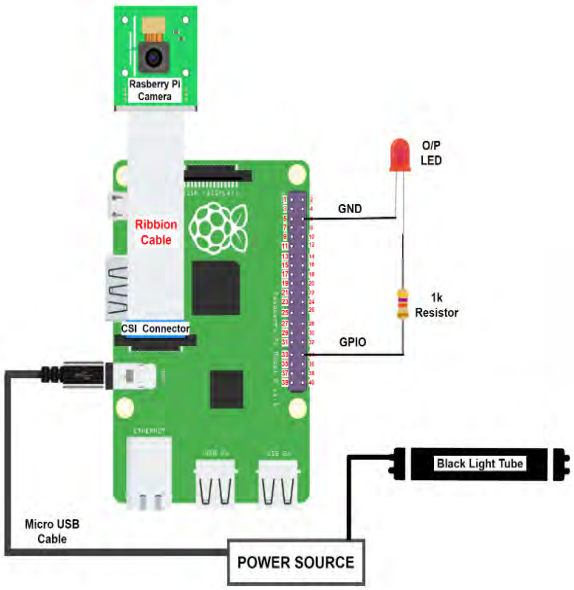


Fig.3 Circuit Diagram

2.Currency is placed under the presence of UV light; which results is completing the 1st step of the system.

3.The camera is used for taking clear picture of the currency which will helps for further process.

4.Micro-controller with the program uses the data collected by the camera for image processing purpose.

5.Finally the result will be displayed as per the result.

V.FLOW CHART

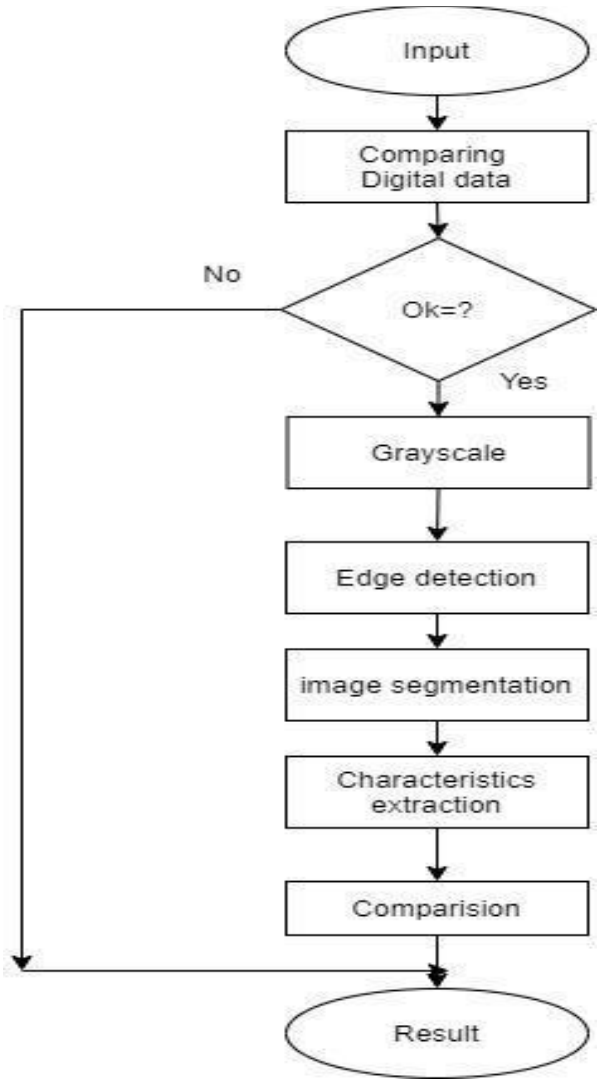


Fig.4 Flowchart

VI.LITERATURE SURVEY

Statistics obtained from the survey are summarized as follows:

- Extracting words and numbers from the image source is very important for detecting the fake currency. This paper gives the idea about real time extracting the numbers on the number plates of vehicles using OpenCV.

- For detecting and extracting information is very important for image processing techniques. But the time taken by the processor should be less so the

work could be done in less time. This paper gives the comparison of time taken by the processor using MATLAB and OpenCV.

- This paper explains the idea about image processing and how the workflow of image processing works in OpenCV

- For detecting the currency, image processing is one of the best technologies presents. But which area is to be extracted is very important, this paper helps us to find out the principal areas to be extracted during image processing?

- Indian currency has a very interesting feature of producing luminous effect under the Ultraviolet light, from which the detection of real currency is very easy. This paper gives the idea about detection of currency using Ultraviolet light emission.

- Image processing can be done easily using OpenCV. This paper gives the idea about the working of image processing using OpenCV library.

- Image processing techniques are not only limited to OpenCV and MATLAB techniques. This paper helps us to know some of the methods that can be used to determine the fake currencies.

VII.APPLICATIONS

Inflation
Counterfeit money may lead to increase in prices (inflation) due to more money getting circulated in the economy - an unauthorized artificial increase in money supply. Hence use of systems like these will help in economy of India.

Business
Companies not being reimbursed for counterfeits. This has led to companies losing buying power. As such, there is a reduction in the value of real money. Small scale or large scale every company is affected by fake currency. These losses can be minimized with this system.

Banks
While depositing cash, if the bank is able to establish that the notes are fake, these will not be credited to the customer's account. What is more, the note will not be returned to the tenderer.

Convenient
Every household can use this device as it is very convenient to use. Small shops, business, stalls etc., in short, every place where transaction of money takes place this device can be conveniently used.

VIII.RESULTS

With the use of IOT the human effort is been reduced and it became easy to controlled the temperature, humidity and cotton dust.With the implementation of the product described in this paper, the aim is to efficiently monitor the water parameters and display the data on the website. And if any parameter changes above there threshold value then it will notify the users via Email alert.

IX.FUTURE SCOPE

This project can be taken further into an app which can be easily used in your mobile phones so it can be used in every household. This will not only improve economy of our country but also help in fighting with Inflation. Further, currencies from all over the world can be taken into consideration. Notes of different denomination could be considered. This system could be installed in banks, malls, jewelers store all other places where huge money transaction takes places.

ACKNOWLEDGMENT

This project cannot be entirely created by an individual. The timely completion of the project ‘Design and implementation of Fake Currency Detection System Using UV Detection and Image Processing’ has been possible because of our teacher and project guide Mr. Vaibhav Gijare who provided us with guidance and motivation throughout its making. We thank him for giving us an opportunity to create this project.We are also thankful to Dr. S.C.Patil (Electronics Department, HOD) for her guidance and to our parents for providing all possible resources to gain the best possible knowledge.Finally, we would thank our college ‘Thakur College of Engineering and Technology’ for providing us with a platform and the necessary facilities to make this project.

REFERENCES

[1] Rahul R. Palekar, Sushant U. Parab and Dhrumil P. Parikh,"Real Time License Plate Detection UsingOpenCV and Tesseract ",International Conference on Communication and Signal Processing, April 6-8, 2017, India

[2] Matuska, S., Hudec, R., &Benco, M. (2012). The comparison of CPU time consumption for image processing algorithm in Matlab and OpenCV. 2012 ELEKTRO

[3] Vishnu R and Bini Omman , "Principal Features for Indian Currency Recognition", Department of Computer Science& Engineering, SCMS School of Engineering & Technology, Ernakulam, Kerala, India, 2014 Annual IEEE India Conference (INDICON)

[4] Kamesh Santhanam, Sairam Sekaran ,Sriram Vaikundam and Anbu Mani Kumarasamy, "Counterfeit Currency Detection Technique using Image Processing, Polarization Principle and Holographic Technique", Department of Electronics & Instrumentation Engineering Sri Sairam Engineering College Chennai, India. 2013 Fifth International Conference on Computational Intelligence, Modelling and Simulation

[5] Frazer K. Noble, "Comparison of OpenCV's Feature Detectors and Feature Matchers",Centre for Additive Manufacturing School of Engineering and Advanced Technology Massey University New Zealand, IEEE 2016.

[6] KiranKamble, AnuthiBhansali,PranaliSatalgaonkar ,Shruti Alagundgi, "Counterfeit Currency Detection using Deep Convolutional Neural Network", Department of Computer Science and Engineering Walchand College of Engineering Sangli, India.2019 IEEE Pune Section International Conference (PuneCon) MIT World Peace University, Pune, India. Dec 18-20, 2019.

Online Handwritten Signature Verification using Multilayer Perceptron Neural Networks

Vidhi kokane
E&TC department,
Thakur College of Engineering and Technology,
Mumbai,India,
vidhikokane8@gmail.com

Hiral Pal
E&TC department,
Thakur College of Engineering and Technology,
Mumbai,India,
hiralpal03@gmail.com

Lokesh Dugar
E&TC department,
Thakur College of Engineering and Technology,
Mumbai,India,
dugarlokesh3@gmail.com

Manoj Chavan
Faculty, E&TC department,
Thakur College of Engineering and Technology,
Mumbai,India,
prof.manoj@gmail.com

***Abstract*— Online Signature verification is a technique used by banks, intelligence agencies and high-profile institutions to validate the identity of an individual. Signature verification is often used to compare signatures in bank offices and other branch capture. An image of a signature or a direct signature is fed into the signature verification software and compared to the signature image on file. The need for a reliable means of personal identification presents a challenge to almost any large modern organization. Handwritten signatures occupy a very special place in this wide set of biometric traits. This is mainly due to the fact that handwritten signatures have long been established as the most widespread means of personal verification. Signatures are generally recognized as a legal means of verifying an individual's identity by administrative and financial institutions. The system is first trained with a particular number of signatures, and after that it is tested with particular number of signatures. Then it differentiates the genuine or forged signatures with high precision. Some additional features, like image compression, are also available. In the proposed method, we have used DWT with MLP NN classifier on Azimuth and Pressure feature for signature verification. This method was applied on SVC 2004 database. These aspects have great theoretical and practical relevance since they highlight the large difference between humans and machines in perceiving, processing, and verifying signatures, while providing fundamental information for developing the next generation systems, with high adaptive capabilities.**

Keywords—online signature verification, pressure, azimuth characteristics, DWT (discrete wavelet transform), neural networks, multilayer perceptron.

I. INTRODUCTION

Signature verification is a common behavioral biometric to identify human beings for purposes of verifying their identity. Signatures are particularly useful for identification of a particular person because each person's signature is highly unique. Signature verification system is also used by banks, intelligence agencies and state-of-the-art institutions to verify personal identity. For comparison signature verification is used at bank offices and other branch offices. A signature or direct signature image is included in the signature confirmation software and is matched with the signature image on file.

Handwritten signatures is important for detection of biometric features as handwritten signatures are used for personal authentication. Some additional features, like image compression, are also available. In the proposed method, we have used DWT with ANN classifier for signature verification. This method was applied on SVC 2004 database. [1] Wavelets can be merged, using the multiplication process and the total amount called convolution, with unknown signal components (data) to extract data from an unknown signal. To improve the difference between the original signature and its deception, the signature is verified in the DWT domain. [2]

The aim is to simplify the integration of signature verification technologies into other common machines to create complete solutions for various trading systems such as bank insurance, health care, ID security, document management, e-commerce, and sales-sales environment.

II. LITERATURE SURVEY

There are many methods that used for signature recognition, this section explains some of these methods:

1. Convolutional Neural Network Based Offline Signature Verification Application (2018):

In this study, deep learning method is used for offline signature verification. A Convolutional Neural Network (CNN) ad hoc models were used as deep learning method. The Convolutional Neural Networks used have been trained separately from each other by using two formats: Writer Dependent (WD) and Writer Independent (WI). The aim to increase the obtained results by using different DL approaches which is supported by extra feature extraction methods.

2. Signature Verification Using Neural Network (2012):

The RGB image of the signature is converted into gray scale and then to binary image. Thinning is applied to make the signature lines as single thickness lines and any noise present in scanned images are removed thus making the signature image ready to extract features. MLP/RBF are better verification Technique to extract

features. The features used to extract information should to change for accurate results.

3. A new signature verification technique based on a two stage neural network classifier (2001):
The approach towards this goal is to implement the structure of the neural network classifier is a one-class-one-network scheme. That is for each signature owner an individual classifier is being implemented. Each time signatures from a new owner are added to the SRVS database, only a small, fixed-size, neural-network-based classifier must be trained. The first limitation is the size of the neural network. It is very difficult, for very large neural networks, to get trained. As the amount of the training data increases, this difficulty becomes a serious obstacle for the training process.

4. Signature verification using multiple neural classifiers (1997):
Feed-forward neural networks were used for the individual classification tasks. The networks were trained using the standard back propagation algorithm. The features used in the present approach can be made more effective if such components can be identified and eliminated before feature extraction. This would also reduce computational overhead of the scheme.

DATA FLOW DIAGRAM

1. Input:

1. For an on-line signature verification system, input is dynamic. This input is normally captured through a digital tablet or like other device. This input is digitized and fed for processing. First of all pre-processing is done on the input received and then some features are extracted from the captured online data on the basis of which the signature is validated.

***2*. Preprocessing:**

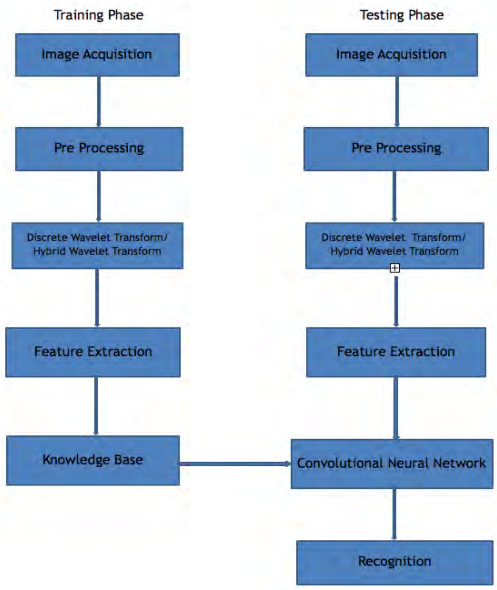
There are some common preprocessing steps, aimed to improve the performance of a verification system. These include size normalization, smoothing of the trajectory and resampling of the signature data.

***3*. Feature Extraction :**

Feature extraction stage is one of the crucial stages of an online signature verification system. The user's signature is acquired in real-time. By using this dynamic data, further feature such as acceleration, velocity, and instantaneous trajectory angles and displacements can be extracted. The features are extracted using parameters such as pressure by which the user is signing on the pressure pad and azimuth which is the angle of the pen on the signing pad.

4*.Verification*:

During the verification stage, a signature to be tested and an ID of a claimed user are submitted to the system. The signature is compared to the data base for reference. A threshold value is defined and the test signature is classified as genuine or forged depending on the threshold value.



III. OBJECTIVES

1. The objective of the project is to build a signature verification system which is efficient and accurate and has a
- Low False Rejection Rate (FRR)
- Low False Acceptance Rate (FAR)
- Reduce the Computational Timing

2. The practical benefit is that having fewer parameters greatly improves the time it takes to learn as well as reduces the amount of data required to train the model. Thus, reducing computational timing.

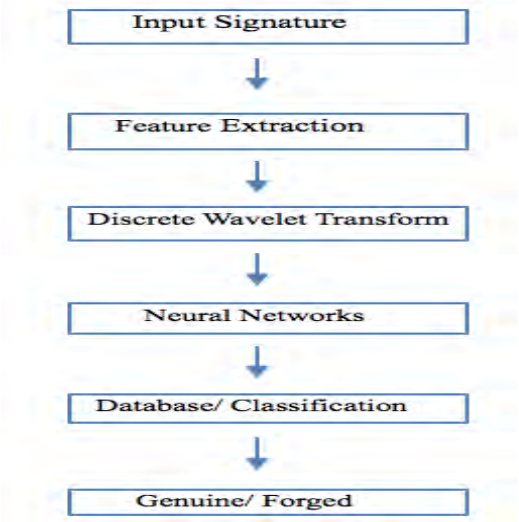


Fig 1. BLOCK DIAGRAM

IV. PROPOSED METHODOLODY

A signature image, basically a set of points that are distributed in a well-defined area with distinctive features. Global features can capture nature of the distribution of these points are ideally suited for gross characterization of the signatures. These features, obviously, do not capture the well-designed features of

the signature images that are important for obtaining bone or copies, but they are powerful enough to eliminate the error of replacement. All signatures contain an X-coordinate- scaled cursor location near the x-axis, Y-coordinate – Positioned cursor position next to the y axis, Timestamp – program time in which the event was posted, Button status – current button status (0 with a pen-up and 1 with a pen at the bottom), Azimuth - rotation of the cursor according to the axis, Altitude - vertical angle towards the positive z-axis, Normal pressure correction position [4].The system is first trained with a particular number of signatures, and after that it is tested with a particular number of signatures. Then it differentiates the genuine or forged signatures with high precision. In the proposed method, we have used DWT with ANN classifier for signature verification.

Discrete wavelet transform (DWT) is a transform that decomposes a given signal into a number of sets. Signature identification consists of three phases: Pre-processing, feature extraction and identification. The x and y positions of signature points are extracted and every signal is represented as 1D time domain signal. Pressure data points and angle of the npen (azimuth) are extracted using graphical pressure pad. It is then used as the third time domain signal. These signals are then normalized and resampled. Discrete wavelet transform is used to extract features from these signals. Sub band decomposition has been used to extract personality traits from DWT features to strengthen individual signatures. To enhance the difference between a genuine and its forgery, the signature is verified in DWT domain. In the test phase, the neural networks is trained using the input signatures. This method was applied on SVC 2004 database. Pressure and Azimuth were selected as the two features selected for this purpose. We have studied SVC 2004 database. 40 users are having 40 signatures each in which 20 signatures are genuine and 20 are skilled forged. Primarily 3 to 20 genuine signatures are used to train the system. A matrix of 1*256 will be formed. This matrix will be given as an input to feature extraction block. Its output will be 1*128 matrix which will have low frequency [4]. It will be given to Discrete Wavelet Transform where we have 2 orthogonal matrices. A discrete wavelet transform will be formed. It will be given to feedforward neural networks [5]. And then output of it will be given to database for identification and verification. Identification contains matching a user's signature with all the signatures in the database. Verification is a process in which user's signature is verified with his signature in the database. And then based on these results, a signature is decided as genuine or forged one.

Features used	Database Size				Features Extracted	Results	
	No. Of users	No. Of sign per user	Forged sign	Total sign		FAR	FRR
1.Pressure	10	20	20	40	X-coordinate- scaled cursor position along the x-axis		
2.Azimuth					Y-coordinate- scaled cursor position along the y-axis		
					Time stamp - system time at which the event was posted.		
					Button status - current button status (0 for pen-up and 1 for pen down)		
					Azimuth - clockwise rotation of cursor about the z-axis		
					Altitude - angle upward toward the positive z-axis		
					Pressure - adjusted state of the normal pressure.		
					Total time		

The proposed system distinguishes between original and forged signatures using Artificial Neural Network (ANN) & Multilayer Perceptron for training and verification of signatures. The complete design of our signature recognition system is as follows: Signature detection, Preparation, feature removal, and segmentation. The feature removal process is an important step in building any signature verification system because it is the key to identifying and distinguishing a user's signature from another. The work remains is whether to take all samples or variation in sample to achieve the best computational time and low FAR and FRR.

$$FAR = \frac{Numberofforgeriesaccepted}{Numberofforgeriestested} \times 100$$

$$FRR = \frac{NumberoforiginalRejected}{Numberoforiginaltested} \times 100$$

V. RESULT

Signature verification produces two types of errors FAR and FRR. We are currently working on SVC2004 database, on which we are trying to identify the signatures for which the system fails and to minimize the Equal Error Rate. Currently the Equal Error Rate is 11.27%. We are currently working on normalizing image of the signature sample and plotting those signatures using the significant database characteristics such as pressure and azimuth. Applying Discrete Wavelength Transform on the signature we achieve the following results.

VI. CONCLUSION

This paper presents the real time implementation of online signature verification. A practical signature verification system incorporating Multi-layer Perceptron neural network has been successfully developed and evaluated. The proposed system achieves accuracy which supports its algorithm, yet the accuracy of the system could be further increased by using different techniques and research and implementation of

a generalized system needs to be done. A minimum EER rate will make the system relevant for use in real time applications and will make human life much easier. In the future, efforts will be made to make the system for reliable and efficient. It is hoped that this research will contribute some knowledge in signature recognition.

ACKNOWLEDGEMENT

We express our thankfulness to our Project guide Mr. Manoj Chavan, Department of Electronic and Telecommunication Engineering for his persistent direction. He has always urged us to be engaged, his perception and remarks helped us to build up the general heading of the work. We might likewise want to thank our organization 'Thakur College of Engineering & Technology', all staff members: Teaching and Non-teaching, and all Head of Departments without whom this task would have been a distant reality. We might want to thank hard and fast colleagues and companions for their company and co-activity amid this period.

REFERENCES

[1] Manoj Kumar," Signature verification using neural networks," vol.4, no.09 Sep 2012, pp.1498-1504.

[2] Donato Impedovo and Giuseppe Pirlo, Member, IEEE, "Automatic Signature Verification: The State of the Art," IEEE Transaction on systems, man, & cybernetics— part C: application & reviews, Vol. 38, No. 5, September 2008.

[3] Y. LeCun, L. Bottou, Y. Bengio, and P. Haffner, "Gradient- based learning applied to document recognition," Proc. IEEE, vol. 86, no. 11, pp. 2278–2324, 1999.

[4] Y. LeCun et al., "Handwritten digit recognition with a backpropagation network, ‖ in Advances in neural information processing systems," 1990, pp. 396–404.

[5] R. Bajaj and S. Chaudhury, "Signature verification using multiple neural classifiers, "Pattern Recognit., vol. 30, no. 1, 1997, pp. 1–7.

[6] H. Baltzakis and N. Papamarkos," A new signature verification technique based on a two-stage neural network classifier, ‖ Eng. Appl. Artif. Intell., vol. 14, pp. 95– 103, 2001.

[7] Maged M.M Fahmy," Online handwritten signature verification system based on DWT features extraction and neural networks classification, 12 June 2010. pp. 59-70.

[8] On-line Signature Verification using Wavelet Packet by Kaiyue Wang, Yunhong Wang and Zhaoxiang Zhang Laboratory of Intelligent Recognition and Image Processing, Beijing Key Laboratory of Digital Media, Beihang University, Beijing, 100191, China.

[9] Mathworks- MATLAB2014b and Simulink

Design and Development of Intelligent Traffic Lights Control

Mrs. Poorva Waingankar
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East), Mumbai - 400 101
pwaingankar@gmail.com

Anjali Singh
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East), Mumbai – 400101
singhanjali1219@gmail.com

Hrishu Singh
Electronics Department
Thakur College of Engineering and Technology (TCET)
Kandivali (East), Mumbai - 400101
hrishusingh12@gmail.com

Ajay Yadav
Department of Electronics
Thakur College of Engineering and Technology
Mumbai, India
yajay3889@gmail.com

***Abstract*—TheTraffic jam is one of many countries facing major challenges. We can design and develop a traffic monitoring and control system to overcome those problems. The project is base d on research that focuses on the design and development of an intelligent traffic light controller. It was observed that the automatic traffic light system cannot be regarded as an ideal traffic controller because the duration of the traffic light does not depend on the current traffic in a road or lane. This results in oversaturation of a lane already filled by multiple vehicles. Intelligent traffic light control design and implementation can be achieved by Fuzzy logic. The Fuzzy logic is used as it can mimic human intelligence and can be used to control duration of traffic light.**

The adjustment in the time or length of the green light will depend on the vehicles entering or queuing at the lanes. When using Fuzzy logic, traffic congestion can be significantly minimized, as well as fuel consumption minimized as a vehicle's waiting ti me is decreased. This also contributes to less air emissions and noise pollution.

Keywords—Membership Function, Fuzzy Logic, Queue, Extension time etc.

I. INTRODUCTION

TextileMonitoring and city traffic management is becoming a big problem in several countries. With the increasing number of road vehicles, of the traffic control authority or The Ministry of Transport, as the regulate or, must find new ways or steps to address this issue. Traffic signals are typical features in urban areas around the world and monitor vehicle number. Their key objectives are to increase traffic safety at the inter section, optimize the intersection potential and reduce the delays. It is understandable that automatic control systems should relieve humans from manual control, but in many circumstances such automatic system does not function well, particularly during over-saturated or unusual load conditions that may be due to algorithm or sensing device limitations. Manual control seems to be stronger in this way, because of the intelligence of the Traffic policemen understand the state of Traffic at the respective junctions. Thus, careful implementation of traffic signal control will result in through road network efficiency to yield both economic and environmental benefits. The traffic lights shift at constant cycle time inside a traditional traffic light controller. In this paper we are going to discuss about an intelligent Traffic lights control system with Fuzzy logic technology capable of imitating human intelligence That's right traffic congestion is done using road signals. Due to the increase in traffic on the streets, in public performance and time-controlled signal systems did not provide a solution to high traffic congestion. The aim of the traffic congestion problem is to reduce road delays by making effective use of available traffic system signals without building new roads. for traffic lights operation. Traffic lights control can be simulated in the software using Fuzzy logic controllers. Study on simulation of traffic lights such as waiting time, density, cost, etc. can also be carried out using the Computer The fuzzy logic controller 's rules and membership functions can be selected and modified, and its outputs can be compared across several different representations. The working of fuzzy logic can be explained as "If the traffic on the north or south lanes is heavier and the traffic on the west or east lanes is lower, then the lights on the north and south lanes will stay green longer." The Fuzzy Logic Controller can now easily follow these rules. The beauty of fuzzy logic is that it allows for the quantification and interpretation of fuzzy terms and conditions such as "strong," "less" and "longer.

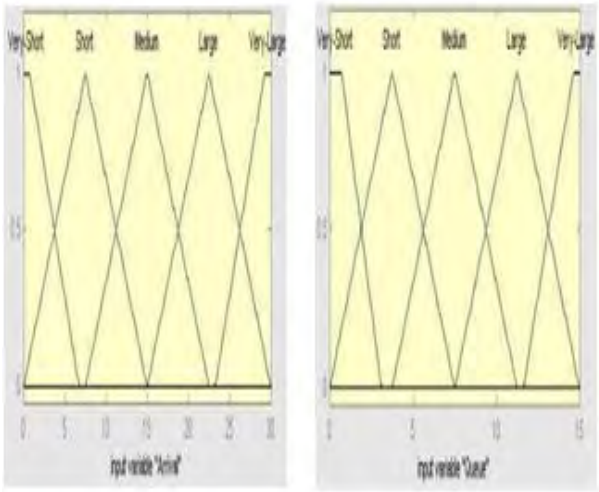
II. FUZZY VARIABLE

Input Variable		Output Variable
Arrival	Queue	Extension time
Very-Short	Very-Short	Zero
Short	Short	Short
Medium	Medium	Medium
Large	Large	Medium
Very-Large	Very-Large	Large

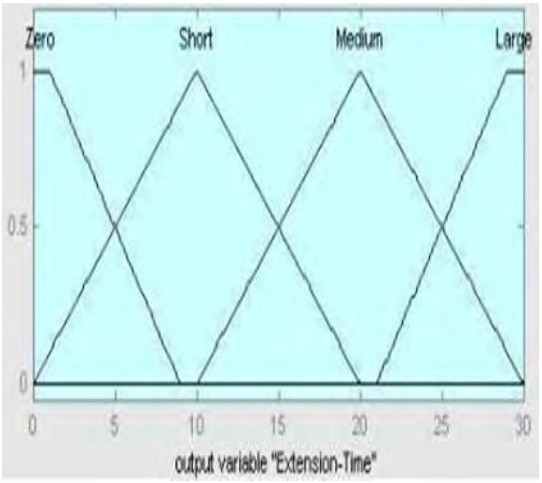
III. MEMBERSHIP FUNCTIONS

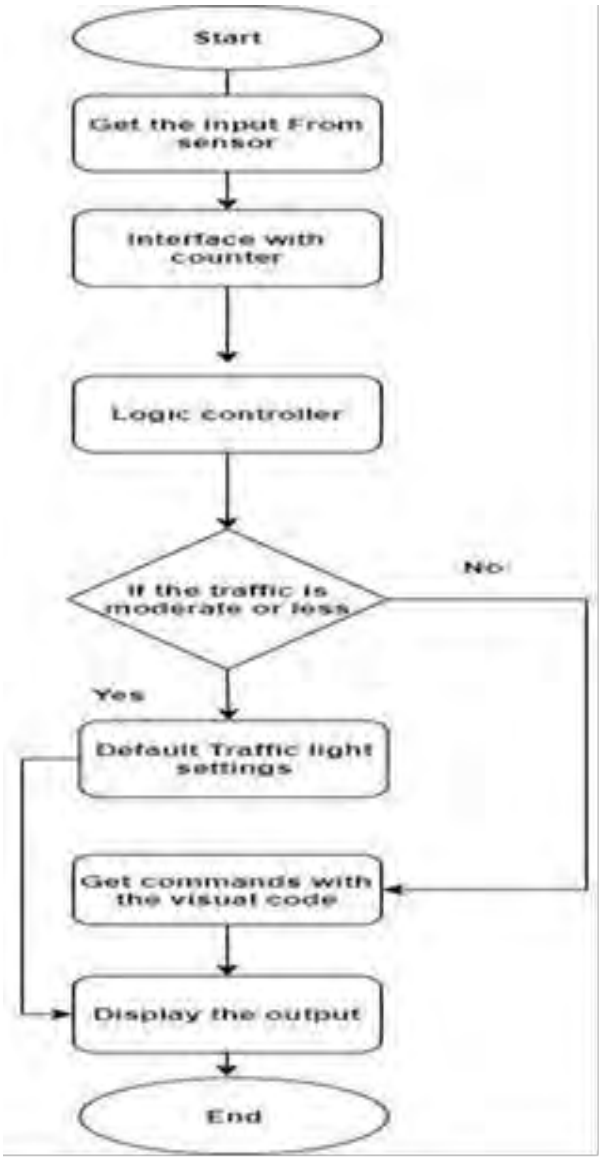
The Membership function of fuzzy logic tool is used to plot the inputs and output. As for each input and output of fuzzy variable we will have five membership function

Membership function plot for both inputs are:



Membership function plot for outputs is:





IV. FLOWCHART

The following Flowchart explain the working of intelligence traffic light controller in one lane. Similarly, the flowchart can be drawn to explain the working of intelligence traffic light control in another lane.

1. The two sensors positioned at a particular distance will sense t he presence of vehicles between them.
2. The counter take the input from the sensor and get incremented.
3. The counter output is passed to an loop, where it will compare the counter output i.e. number of vehicles between the two sensor with a fixed amount of number of vehicles.

Case 1.

1. .If number of vehicles between two sensors < the fixed number of vehicles that is the traffic is moderate or less.
2. .There will be no need of any change in the duration of traffic light that is the default traffic light settings will be followed.

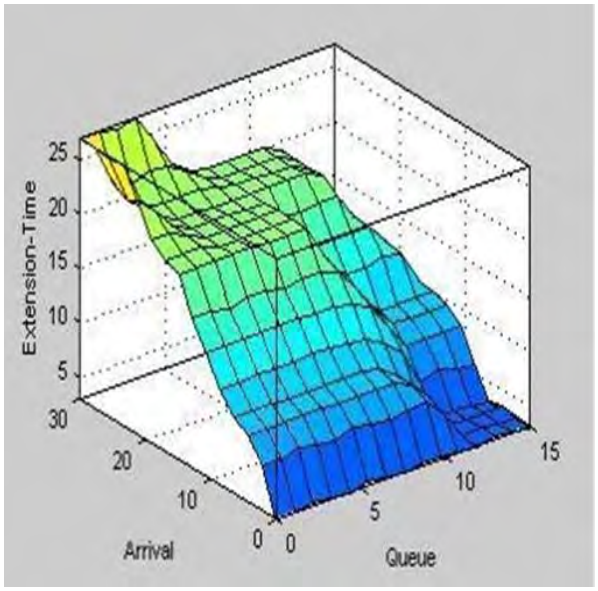
Case 2.

1. The number of vehicles between two sensors > the fixed number of vehicles that is the traffic is high.
2. it means there is a need of change in the default traffic light. 3.The fuzzy logic will increase the duration of green light for that lane.
3. Accordingly the duration of red light for another lane will be increased.
4. As the counter output for any another lane increases, then the changes will made accordingly.

V. FUZZY RULES AND OUTPUT

1. Fuzzy rules decide the length of Extension time.
2.As we have 5 membership function for both the input There will be 25 fuzzy rules.
Example-
Queue time=Short
Arrival time=Very-Short Extension time=Zero Output

- The extension time (z-axis) = small
- when the density of arrival (y-axis) = small
- the density of the queue side (x-axis) =also



1. If (Queue is Very-Short) and (Arrival is Very-Short) then (Extension-Time is Zero) (1)
2. If (Queue is Short) and (Arrival is Very-Short) then (Extension-Time is Zero) (1)
3. If (Queue is Medium) and (Arrival is Very-Short) then (Extension-Time is Zero) (1)
4. If (Queue is Large) and (Arrival is Very-Short) then (Extension-Time is Zero) (1)
5. If (Queue is Very-Large) and (Arrival is Very-Short) then (Extension-Time is Zero) (1)
6. If (Queue is Very-Short) and (Arrival is Short) then (Extension-Time is Short) (1)
7. If (Queue is Short) and (Arrival is Short) then (Extension-Time is Short) (1)
8. If (Queue is Medium) and (Arrival is Short) then (Extension-Time is Short) (1)
9. If (Queue is Large) and (Arrival is Short) then (Extension-Time is Zero) (1)
10. If (Queue is Very-Large) and (Arrival is Short) then (Extension-Time is Zero) (1)
11. If (Queue is Very-Short) and (Arrival is Medium) then (Extension-Time is Medium) (1)
12. If (Queue is Short) and (Arrival is Medium) then (Extension-Time is Medium) (1)
13. If (Queue is Medium) and (Arrival is Medium) then (Extension-Time is Medium) (1)
14. If (Queue is Large) and (Arrival is Medium) then (Extension-Time is Short) (1)
15. If (Queue is Very-Large) and (Arrival is Medium) then (Extension-Time is Short) (1)
16. If (Queue is Very-Short) and (Arrival is Large) then (Extension-Time is Large) (1)
17. If (Queue is Short) and (Arrival is Large) then (Extension-Time is Medium) (1)
18. If (Queue is Medium) and (Arrival is Large) then (Extension-Time is Medium) (1)
19. If (Queue is Large) and (Arrival is Large) then (Extension-Time is Medium) (1)
20. If (Queue is Very-Large) and (Arrival is Large) then (Extension-Time is Short) (1)
21. If (Queue is Very-Short) and (Arrival is Very-Large) then (Extension-Time is Large) (1)
22. If (Queue is Short) and (Arrival is Very-Large) then (Extension-Time is Large) (1)
23. If (Queue is Medium) and (Arrival is Very-Large) then (Extension-Time is Medium) (1)
24. If (Queue is Large) and (Arrival is Very-Large) then (Extension-Time is Medium) (1)
25. If (Queue is Very-Large) and (Arrival is Very-Large) then (Extension-Time is Short) (1)

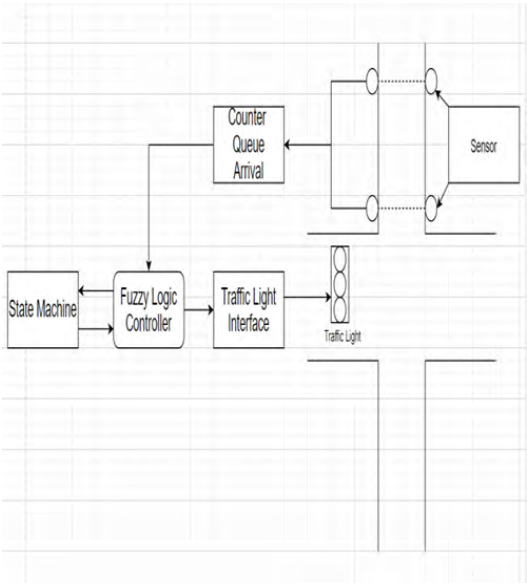
VI. APPLICATION

1. **Major cities**
   This project is very useful in major cities since the vehicle traffic congestion is mostly high at places. The proposed model will reduce the congestion and saving time and fuel of people**.**
2. **Changing behaviour of people-**
   There are many people who break traffic rules by not obeying the signal if the signal duration is long. This system will help them not break any rules since signal duration will be reduced which saves time of the people.
3. **Implementation of Fuzzy Logic-**
   This Project is expected to do the most efficient use of fuzzy logic to mimic the human behaviour. It will help upcoming engineers to understand the concept practically and clearly.
4. **Smart City-**
   As we know there are numbers of smart cities developing all around the world. Adopting this System to the Smart City standards enabling effective and smarter way of reducing traffic.

VII. ANALYSIS OF DESIGN

Two sensors are used. Sensors sense the presence of vehicles between them. Counter take the input from the sensor and get incremented. The traffic signal light will be decided by using fuzzy logic controller. The duration of green light is controlled by fuzzy controller. The state machine controls the sequence of statements that should cycle through the Fuzzy traffic controller. For each traffic process, there is one State Light. There is one default condition occurring when no incoming traffic is observed

VIII. BLOCK DIAGRAM



The two electromagnetic sensors are used. The first sensor behind each light counts the number of cars passing through the lights, and the second sensor located behind the first sensor counts the number of

cars coming to the intersection at a distance from the lights. The number of cars between the traffic lights is determined by the reading difference between the two sensors. Counter take input from sensors and count the number of vehicles. Depending upon number of vehicles the traffic signal light will be decided by using fuzzy logic controller. The duty of the fuzzy logic controller is to control the duration of the green time according to the traffic conditions. The state machine controls the sequence of statements that should cycle through the Fuzzy traffic controller. For each traffic process, there is one State Light. There is one default condition occurring when no incoming traffic is observed. This default state for a particular approach corresponds tothe green time, usually to the main approach. A state can be skipped in the sequence of States if the corresponding solution does not include vehicle queues

FUZZY RULES

Rules	Inputs			Output
No	Arriving vehicle	Queuing vehicle	Fog	G duration
1	H	L	L	S
2	H	L	M	M
3	H	L	H	H
4	H	M	L	M
5	H	M	M	M
6	H	M	H	H
7	H	H	L	H
8	H	H	M	H
9	H	H	H	H
10	M	L	L	S
11	M	L	M	M
12	M	L	H	M
13	M	M	L	M
14	M	M	M	M
15	M	M	H	M
16	M	H	L	H
17	M	H	M	M
18	M	H	H	M
19	L	L	L	S
20	L	L	M	M
21	L	L	H	M
22	L	M	L	M
23	L	M	M	H
24	L	M	H	M
25	L	H	L	S

IX. FUTURE SCOPE

- Fixed the delay provided.
- Replacing human work.
- Design and develop intelligence traffic management system.
- Reduce the density of traffic at junctions.
- Provide a switching system to pedestrian.
- Prioritizing emergency vehicles
-

X. CONCLUSION

This project will provide an intelligent traffic control system. As traffic lights will change according to density of the traffic in lane it will result in reducing traffic jams, noise pollutions and time. Introduction of this project will lead to a new traffic management system and will also reduce lots of human work

ACKNOWLEDGMENT

This project cannot be entirely created by an individual. The timely completion of the project 'Design and Development of Intelligent Traffic Lights control' has been possible because of our teacher and project guide Mrs. Poorva Waingankar who provided us with guidance and motivation throughout its making. We thank him for giving us an opportunity to create this project. We are also thankful to Dr S.C. Patil (Electronics Department, HOD) for his guidance and to our parents for providing all possible resources to gain the best possible knowledge. Finally, we would thank our college 'Thakur College of Engineering and Technology' for providing us with a platform and the necessary facilities to make this project.

REFERENCES

[1] Leaman, J., La, H. M., & Nguyen, L. (2016). Development of a smart wheelchair for people with disabilities. 2016 IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI)

[2] S. Vijayprasath,DR.Rsukanesh and S. palanival Rajan "Innovative Techniques using wireless sensors in designing smart system for disabled patints" International Journal of power control signals and computation(IJPCSC) VOL.1 NO. 4

[3] Riaz, N., & Aamir, J. B. (2014). Electrical wheel chair with retractable solar panels. 2014 International Conference on Energy Systems and Policies (ICESP). doi:10.1109/icesp.2014.7346983

[4] Vijayakumar, C., Kumar, M. P., Sivaji, S., Sadulla, S., Prathiba, J., & Kumar, K. V. (2013). Sensors based automated wheelchair. 2013 International Conference on Green Computing, Communication and Conservation of Energy (ICGCE). doi:10.1109/icgce.2013.6823476

[5] Electric powered wheelchairs. (2005). IEEE Control Systems, 25(2), 22–34. doi:10.1109/mcs.2005.1411382

[6] Basmajian, A., Blanco, E. E., & Asada, H. H. (n.d.). The marionette bed: automated rolling and repositioning of bedridden patients. Proceedings 2002 IEEE International Conference on Robotics and Automation (Cat. No.02CH37292).

Automation in Attendance System Using Facial Recogintion

Anuj dubey
Department of Electronics and Telecommunication
Thakur College of Engg. & Technology
Mumbai, India
1032170444@tcetmumbai.in

Anuj dubey
Department of Electronics and Telecommunication
Thakur College of Engg. & Technology
Mumbai, India
1032170444@tcetmumbai.in

Shivam Dubey
Department of Electronics and Telecommunication
Thakur College of Engg. & Technology
Mumbai, India
1032170446@tcetmumbai.in

***Abstract*— Viola and Jones introduced a face detection technique using HAAR cascades and ADABoost. Identifying a person with an image has been popularised through the mass media. However, it is less robust to fingerprint or retina scanning. This report describes the face detection and recognition mini-project undertaken for the visual perception and autonomy module at Plymouth university. It reports the technologies available in the Open-Computer-Vision (OpenCV) library and methodology to implement them using Python. For face detection, Haar-Cascades were used and for face recognition Eigenfaces, Fisherfaces and Local binary pattern histograms were used. The methodology is described including flow charts for each stage of the system. Next, the results are shown including plots and screen-shots followed by a discussion of encountered challenges. The report is concluded with the authors' opinion on the project and possible applications.**

Keywords*—*Attendance Automation, Data analysis, Adaboost, Prediction , Recogintion ,Machine learning.

I. INTRODUCTION

Authentication has become one of the most critical issues in today's Computer based communication systems. Face is one of the basic characteristics which can distinguish a person from others. Due to increase in the rate of cyber-crimes, human face recognition has grown as an enormously important method of biometric verification in context of computer vision, pattern recognition,

The techniques to exploit this characteristic have improved a lot since the advent of image processing techniques. Attendance management is done in each and every class in all colleges and schools. In the traditional approach for attendance management, the professor calls student name and records the attendance, thereby managing the system manually. The sole aim of the system described in this paper is to deviate from the traditional system by using a new approach which will take attendance of the students using image processing.
With the world constantly moving towards a digital world, as new technologies like 5G NR uRLLC emerge, making ultra- low latency monitoring and data transfer more possible than ever before – the world is moving to truly use the potential of IoT and technology in our everyday life. While the necessity of such systems might have been questioned about a decade ago, today we are moving towards a world where institutions and society are more inclusive and recognize the value digital infrastructure can bring in everyday life.
This paper describes the working of a Student's Attendance System in a classroom environment which uses Principal Component Analysis (PCA) algorithm as the face recognition technology to distinguish a face from another one and various other objects. The proposed biometric system records and maintains the attendance of the students along with providing the faculty the access to that information at ease.
In the day to day routine it is important to automate thing for reducing the work-load and maintaining the accuracy at the same time but the attendance system in colleges are maintaining a hand record due to which error happens and there is a faulty record with hard to manage files.We are making A system with a framework which provide a simple interface for maintaining the records of the students and staff's attendance without any hassel and error.
The algorithm that we are using for automating the attendance system uses cascade classifier for data traning purpose in the intial stages due to which the accuracy of the system increases and after somelevels of data traning we will provide the algorithm real time data which will increase the efficiency and decrease the error capacity. We are making a system with a framework which provide a simple interface for maintaining the records of the students and staff's attendance without any hassel and error. The objectives of this project is to detect a student face and match the detected face with datasets in database and marking them as present or absent automatically and accurately

II. LITERATURE SURVEY

The methodology used in prediction system was problem and data understanding, data filtering, system modelling and finally system evaluation. This was done

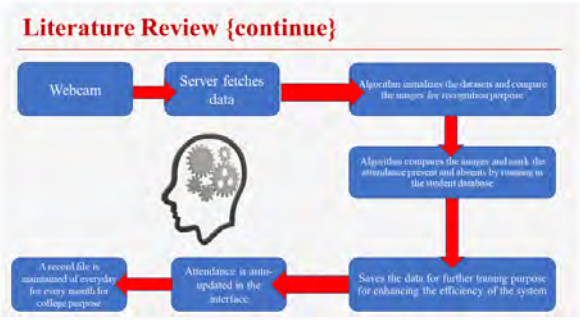
on the existing dataset containing 1140 records and 24 attributes. At last the system was tested and helps the college system to make a correct decision on whether to mark present or absent to the student and staff members .The main goal of the paper is to predict the face the of student based on facial graphics and facial expression. It was found that the haar-caascade model gave an improved accuracy of almost 95% on doing the data analysis.

The methodology used in prediction system was problem and data understanding, data filtering, system modelling and finally system evaluation. This was done on the existing dataset containing 1140 records and 24 attributes. At last the system was tested and helps the college system to make a correct decision on whether to mark present or absent to the student and staff members .The main goal of the paper is to predict the face the of student based on facial graphics and facial expression. It was found that the haar-caascade model gave and improved accuracy of almost 95% on doing the data analysis.

RFID card system is implemented due to its simplicity. However, the user tends to help their friends to check in as long as they have their friend's ID card. The fingerprint system is indeed effective but not efficient because it takes time for the verification process so the user has to line up and perform the verification one by one. However for face recognition, the human face is always exposed and contain less information compared to iris. Iris recognition system which contains more detail might invade the privacy of the user. Voice recognition is available, but it is less accurate compared to other methods. Hence, face recognition system is suggested to be implemented in the student attendance system.

When image quality is taken into consideration, there is a plethora of factors that influence the system's accuracy. It is extremely important to apply various image pre-processing techniques to standardize the images that you supply to a face recognition system. Most face recognition algorithms are extremely sensitive to lighting conditions, so that if it was trained to recognize a person when they are in a dark room, it probably won't recognize them in a bright room, etc. This problem is referred to as "lumination dependent", and there are also many other issues, such as the face should also be in a very consistent position within the images (such as the eyes being in the same pixel coordinates), consistent size, rotation angle, hair and makeup, emotion (smiling, angry, etc), position of lights (to the left or above, etc). This is why it is so important to use a good image preprocessing filters before applying face recognition.

You should also do things like removing the pixels around the face that aren't used, such as with an elliptical mask to only show the inner face region, not the hair and image background, since they change more than the face does. For demonstrates how easily is to convert color images to grayscale (also called 'grayscale'), and then to apply Histogram Equalization [8] as a very simple method of automatically standardizing the brightness and contrast of your facial images. For better results, you could use color face recognition (ideally with color histogram fitting in HSV or another color space instead of RGB), or apply more processing stages such as edge enhancement, contour detection, motion detection, etc. Also, this code is resizing images to a standard size, but this might change the aspect ratio of the face. In [9] is described a method on how to resize an image while keeping its aspect ratio the same. OpenCV uses a type of face detector called a Haar Cascade classifier. Given an image, which can come from a file or from live video, the face detector examines each image location and classifies it as "Face" or "Not Face." Classification assumes a fixed scale for the face, say 50x50 pixels. Since faces in an image might be smaller or larger than this, the classifier runs over the image several times, to search for faces across a range of scales. This may seem an enormous amount of processing, but thanks to algorithmic tricks, explained in the sidebar, classification is very fast, even when it's applied at several scales.



III. PROPOSED SYSTEM

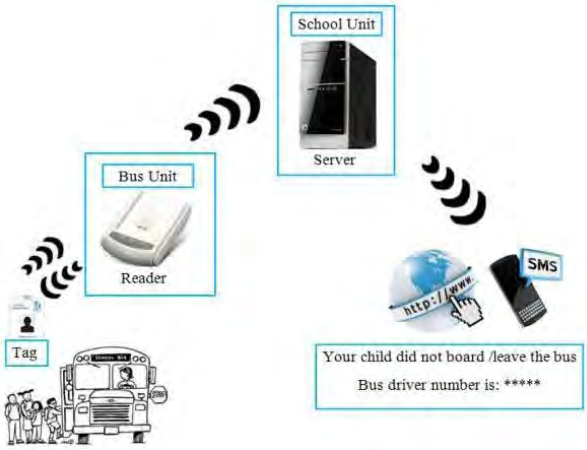


Fig1: The Proposed System Architecture

Choosing Perfect algorithm for Face recognition which provides high accuracy and ease in handling: - It's a very curcial choice for any team to use the best anf most efficient with ease of handling and managing is a very important part and the very intial most important part of project and we came out with a result of using haarcascade as a default algorithm for the face recognition system we are building

Availablility Of DATASETS For Increasing The Accuracy Of The Algorithm At Premature Level:-

As haarcascade makes a special move of have a predefined library of datasets with provide a higher accuracy form the intial stages and gest excellent in accuracy by the time we start using in real life applictions .

Availablilty Of System Which Is Completely Automated And Is Ease Of Use:-

Making an efficient program for face recognition is incomplete without making an easy and manageable user interface for the admin and users too for making and managing datasets and results of the attendance using the program and we had made an user interface using Django to use the system in a very effceint way.

The module that we are using for automating the attendance system uses cascade classifier for data traning purpose in the intial stages due to which the accuracy of the system increases and after somelevels of data traning we will provide the algorithm real time data which will increase the effciency and decrease the error capacity.These algorithms will provide at least a 95% successful recognition rate, out of which less than 3% of the detected faces are false positives for automating the attendance system uses cascade classifier for data traning purpose in the intial stages due to which the accuracy of the system increases .

The approach performs face recognition based student attendance system. The methodology flow begins with the capture of image by using simple and handy interface, followed by pre-processing of the captured facial images, then feature extraction from the facial images, subjective selection and lastly classification of the facial images to be recognized. Face database is used as both training set and testing set to evaluate the performance. Yale face database contains one hundred and sixty-five grayscale images of fifteen individuals. There are eleven images per individual; each image of the individual is in different condition. The conditions included centre-light, with glasses, happy, left-light, without glasses, normal, right-light, sad, sleepy, surprised and wink. These different variations provided by the database is able to ensure the system to be operated consistently in variety of situations and conditions.

For our own database, the images of students are captured by using laptop built in camera and mobile phone camera. Each student provided four images, two for training set and two for testing set. The images captured by using laptop built in camera are categorized as low quality images, whereas mobile phone camera captured images are categorized as high quality images. The high quality images consists of seventeen students while low quality images consists of twenty-six students. The recognition rate of low quality images and high quality images will be compared to draw a conclusion in term of performance between image sets of different quality.

Limitations of the Images

The input image for the proposed approach has to be frontal, upright and only a single face. Although the system is designed to be able to recognize the student with glasses and without glasses, student should provide both facial images with and without glasses to be trained to increase the accuracy to be recognized without glasses. The training image and testing image should be captured by using the same device to avoid quality difference. The students have to register in order to be recognized. The enrolment can be done on the spot through the user-friendly interface.

Testing set and training set images are captured using a camera. There are unwanted noise and uneven lighting exists in the images. Therefore, several pre-processing steps are necessary before proceeding to feature extraction. Pre-processing steps that would be carried out include scaling of image, median filtering, conversion of colour images to grayscale images and adaptive histogram equalization. The details of these steps would be discussed in the later sections.

Scaling of Image

Scaling of images is one of the frequent tasks in image processing. The size of the images has to be carefully manipulated to prevent loss of spatial information. (Gonzalez, R. C., & Woods, 2008), In order to perform face recognition, the size of the image has to be equalized. This has become crucial, especially in the feature extraction process, the test images and training images have to be in the same size and dimension to ensure the precise outcome. Thus, in this proposed approach test images and train images are standardize at size 250 × 250 pixels.

Conversion to Grayscale Image

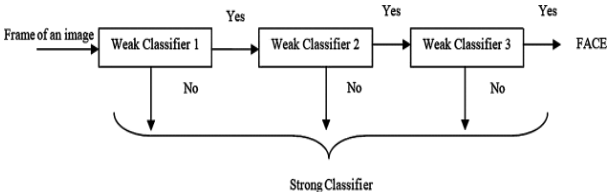
Camera captures color images, however the proposed contrast improvement method CLAHE can only be performed on grayscale images. After improving the contrast, the illumination effect of the images able to be reduced. Algorithm extracts the grayscale features from the contrast improved images as 8 bit texture descriptor (Ojala, T. et al., 2002).Therefore, color images have to be converted to grayscale images before proceeding to the later steps. By converting color images to grayscale images, the complexity of the computation can be reduced resulting in higher speed of computation (Kanan and Cottrell, 2012). Figure 3.4 shows the conversion of images to grayscale image.

Feature Extraction

Different facial images mean there are changes in textural or geometric information. In order to perform face recognition, these features have to be extracted from the facial images and classified appropriately. In this project, enhanced LBP and PCA are used for face recognition. The idea comes from nature of human visual perception which performs face recognition depending on the local statistic and global statistic features. Enhanced LBP extracts the local grayscale features by performing feature extraction on a small region throughout the entire image. On the other hand, PCA extracts the global grayscale features which means feature extraction is performed on the whole image.

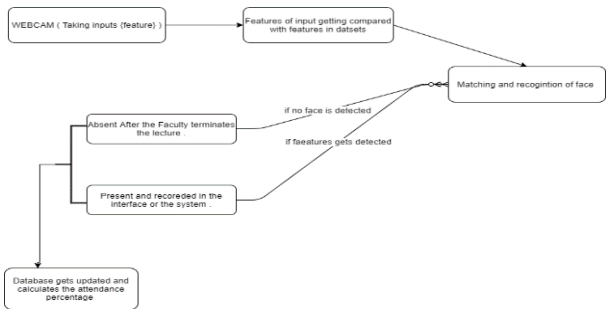
The cascade classifier splits the classification work into two stages:

Training and detection. The training stage does the work of gathering the samples which can be classified as positive and negative. The cascade classifier employs some supporting functions to generate a training dataset and to evaluate the prominence of classifiers. In order to train the cascade classifier, we need a set of positive and negative samples. In our work, we have incorporated the utility called opencv createsamples to create the positive samples for opencv_traincascade. The output file of this function serves as an input to opencv_traincascade to train the detected face. The negative samples are collected from arbitrary images, which do not include the objects to be detected. The flow of the cascade classifier. Initially, the classifier was trained with a few positive and negative samples, which are arbitrary images of the same size, of which both samples were equally scaled in their size. The classifier generates "1" if the region possibly identifies the face and generates "0" otherwise. The major goal of the cascade classifier is to find the face objects of interest at diverse sizes, making the classifier more proficient without altering the size of the input images.



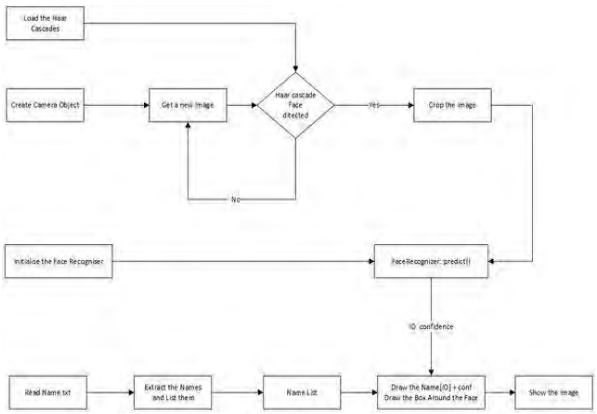
The cascade function is the core part of this algorithm. It is trained with a considerable amount of right and wrong pictures. In the OpenCV package, there are pretrained classifiers for faces and smiles that are stored as XML files. In this project, the "haarcascade_frontalface_default.xml" is used to detect faces and "haarcascade_smile.xml" is applied to detect smiles. To increase the accuracy, a smile can only be detected when it is within a face. As Fig. 6 shows, a smile detected, a face detected, other photo, and no photo are converted to the values 2, 1, 0, and − 1 respectively as feature values. In the case where multiple smiles are detected, this is also equal to 2. If someone posts a neutral tweet (based on their text) but with a photo including a smile, it would be recognized overall as a positive tweet.

Working of interface:-

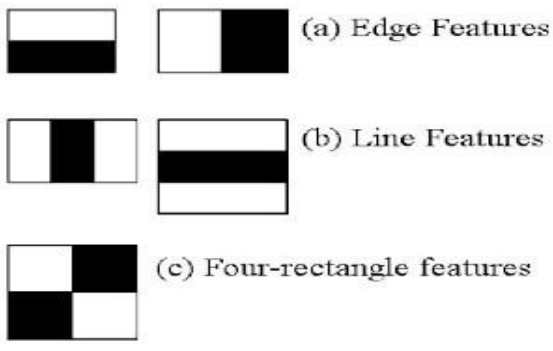


Results and Simulation:-

This project used WEB Scrapping to collect and analyse data (images, patterns) available on various E-commerce sites for the product and created a database of the information. An ML Model was created using the collected data and it was trained using various image processing techniques. The input is then compared to the database and the most accurate output of the product is displayed along with its market price. In the end, using Linear Regression the cost price of that product is predicted using the data collected by WEB Scrapping. Data has become the basis of all decision-making processes whether it's a business or a non-profit organization. To make proper use of this available data and find some meaningful information out of it is what our project aims at achieving. After scraping the sites and gathering the dataset we then performed machine learning algorithms that gives us the require output from a huge amount of data. Machine learning that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves. The process of learning begins with observations or data, such as examples, direct experience, or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers learn automatically without human intervention or assistance and adjust actions accordingly. The machine learning algorithms helps us to make a very efficient model to compare the images and also predict the price of our product.



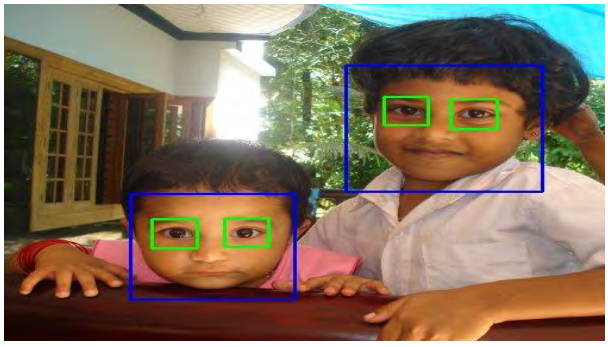
Haar Features:-



Optimal Haar Features of an image:-

They are not directly used but the features (black and white boxes) are what we can call *Haar-like* in the sense that, well you get it by now. Lots of these Haar-like features can be applied to an image and using the Adaboost algorithm which finds an optimal threshold for classifying the training images correctly. But placing one of those somewhere, even on the best possible position, will result in some error still since all images within the positive and negative sets differ from each other. In the end, the Haar features with the smallest error rates are chosen as classifiers.

Some Samples:-



IV. CONCLUSION

This paper presented an RFID-based system that aims at enhancing the safety of children during the daily bus trip to and from the school. RFID-based detection unit located inside the bus detects the RFID tags worn by the children. It then sends, via a GSM modem, the relevant data to the system database server. The system checks and detects which child did not board or leave the bus and issues an alert message to this effect. In addition, the system checks the children attendance and updates the database. The parents can log into system website and monitor the details of their children. Future scope of the project is to build on a robust data management system with encryption and real-time data updation based on firebase technology.

REFERENCES

[1] Face Detection and Recognition using OpenCV, Article, http://shervinemami.info/faceRecognitio n.html, published by Shervin Emami, 2010

[2]Seeing with OpenCV, Article, http://www.cognotics.com/opencv/servo_2007_series/part_1/index.ht ml, published by Robin Hewitt, 2010

[3] OpenCV Homepage, http://opencv.willowgarage.com

[4]Face Recognition Homepage, http://www.face-rec.org/algorithms/

[5]Wikipedia, Three-dimensional face recognition, http://en.wikipedia.org/wiki/Threedimensional_face_recogniton

[6] Wikipedia, Active appearance model, http://en.wikipedia.org/wiki/Active_appe arance_model

[7] Computer Vision Papers, http://www.cvpapers.com/

[8]Wikipedia, Histogram equalization, http://en.wikipedia.org/wiki/Histogram_ equalization [9] Shervin Emami, Rotating or Resizing an Image in OpenCV, http://shervinemami.info/imageTransfor ms.html

This page is kept blank intentionally

Driver Drowsiness Detection Using Face Recognition

Sourav Dambal
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai, India
rahuldambal1234@gmail.com

Priti Ghosh
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology,
Mumbai, India
ghoshpriti30@gmail.com

Maithilee Malewar
Department of Electronics and Telecommunication Engineering *Thakur College of Engineering and Technology*,
Mumbai, India
mathilee.malewar1999@gmai.com

Megha Gupta
Department of Electronics and Telecommunication Engineering,
Thakur College of Engineering and Technology,
Mumbai, India
megha.gupta@thakureducation.org

***Abstract*- The main idea of this project is to develop a non-compliant system that detects any drowsiness / fatigue of any person and can issue a timely warning. Drivers who do not take regular breaks while driving long distances are at greater risk of drowsiness who often fail to see early. According to expert research it shows that about a quarter of all serious road accidents are caused by sleep-deprived drivers, which means that drowsiness causes more road accidents than driving while intoxicated. The system will monitor the driver's eyes using the camera and by improving the algorithm we can detect signs of driver fatigue early to prevent a person from falling asleep. Therefore, this project will help detect driver fatigue in advance and will provide warning in the form of alarms and pop ups.**

In addition, the warning will be disabled by hand rather than automatically. For this purpose, a power opening box will be built that will have a simple mathematical function that if answered correctly will dispel the warning.

If the driver feels drowsy there is a negative response to the conversation. If all the responses indicate that it is possible to get tired for one second, then a warning signal is given in the form of text or sound. This will give a direct indication that drowsiness / fatigue can be used continuously as a driver's performance record. By obtaining a face using OPENCV and performing facial recognition, the driver can be authorized. Examining each frame on a gray scale can determine the proportion of the oral and oral components that will be used to determine the driver's fatigue and drowsiness. The face tag and DLIB library mark are used.

Keywords—Drowsiness detection, driver, face recognition, facial landmarks, eye, sobel edge, dlib, open cv.

I INTRODUCTION

The population has been drowsy on the wheel for some time. It is not a permissible thing but an important problem with side effects that needs to be addressed. One in four car accidents is caused by drowsy driving and one in 25 older drivers reported falling asleep at the wheel 30 days ago. The scary part is that drowsy driving isn't just about sleeping while driving. Drowsy driving may be as minor as a brief seizure when the driver is completely distracted from the road. Drowsiness causes more than 71,000 injuries, 1,500 deaths, and $ 12.5 billion a year. Given the importance of this problem, we believe it is important to develop a solution to find drowsiness, especially in the early stages to prevent accidents. In addition, it is believed that drowsiness can adversely affect people in the workplace and in the classroom. Although sleep deprivation is a problem for everyone, drowsiness at work especially while working with heavy equipment can lead to serious injuries similar to those experienced while driving drowsiness.

This app has alarm-like features that make it unique and easy to use. The blink of an eye quickly closes and reopens the human eye. Each person has a slightly different pattern of light. The pattern varies with closing speed and opening, eye rate and blink time. The blink of an eye lasts about 100-400ms. Research suggests the use of high-quality facial features to make the eye and eyelid crown. The landmarks found in the image receive an eye-catching (EAR) measurement that is used as an eye-opening measurement.

Many accidents occur as a result of drowsiness. Therefore, to prevent these accidents we will build a system using Python and Open CV that will notify the driver when driver feel drowsy. Fatigue plays a role in the estimated 10% of fatal accidents. Fatigue leads to drowsiness by accident. Establishing a sleep deprivation program will help reduce these risks soon.

II. LITERATURE SURVEY

Face detection and skin separation: Facial detection is performed to reduce false detection in the detection of facial features. Accurately identify the shape of the eyes and the mouth. Reject the wrong facial image as much as possible. Eye Care: Sobel Edge is used to get a raw result. The left and right eyes are proportionally separated and templates are made. People's Eyes vary in size, the distance between the camera and the eyes also

varies from frame to frame so all eyeball templates are 12x30 in size. However, the identified gap could not predict drowsiness when the head is tilted left or right. [1]

A smart watch, a PERCLOS controller and a headband containing sensors, have been used by researchers to find drowsiness. But PERCLOS Monitors are bigger in size. No driver wants to wear a headband and the same wristwatch. [2]

The brain computer display works very well in health care. Iris recognition produces high accuracy in a short time. It also supports a flexible vector machine. However, the extracellular electrode receives very few signals from the brain. The Iris recognition feature makes it expensive. SVM provides the absence of effect visibility. [3]

In some studies, the system uses a sensor such as the eye blink sensor used to detect the driver's drowsiness. If it is found that the driver is asleep, the buzzer will start buzzing and extinguish the fire. But a sudden shutdown can lead to traffic jams and still not be able to maintain road safety and can be dangerous. [4]

The mobile phone creates a click and vibration alarm to alert the driver. Open-Source Computer Vision and image processing provide a non-invasive method that can sometimes cause problems if lighting conditions are poor. [5]

Systems require advanced settings to be used. Therefore, to make this process easier and more accessible for the viewing of motorists in terms of artificial viewing techniques used with the smartphone. But using such a large program on a smartphone requires certain basic features on the smartphone that if not functioning properly can disrupt the overall accuracy of the system. [6]

The system can measure driver fatigue and disturbances very well with automatic testing. A less accurate and more sophisticated face tracking system with a computer. [7]

Mobile use of artificial vision, which is able to detect facial and visual gestures that are present in a person such as yawning, eye condition etc., slow-moving or limited hardware and operating conditions. [8]

III. METHODOLOGY

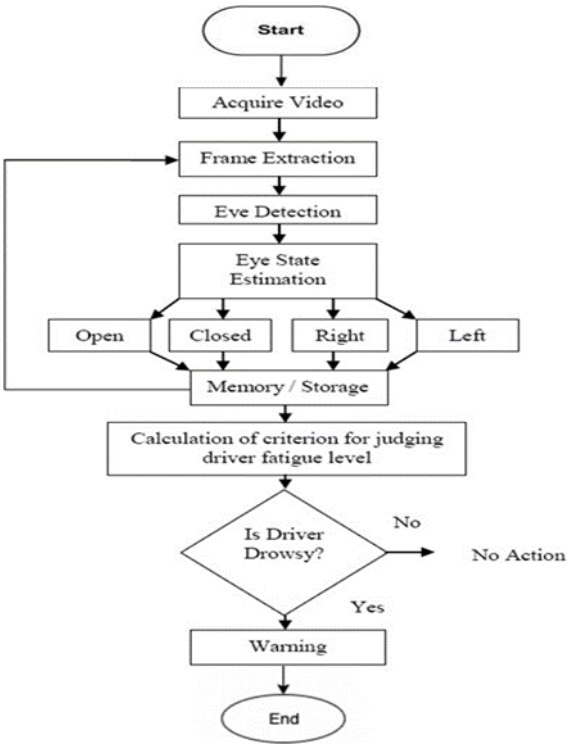


Figure 1: System Flow Diagram

The Different Types of Methodology have been developed to find out drowsiness

A Physiological Level Approach

This method is a trend in which electrodes are used to determine pulse rate, heart rate and brain function information. An ECG is used to calculate heart rate variability and to detect various sleep disorders. A combination of various symptoms such as ECG (electrocardiogram), EEG (electroencephalogram), and EMG (electromyogram) are performed and the result is either whether the person is drowsy or not.

B Behavioral based Approach

In this technique eye blinking frequency, head pose, etc. of a person is monitored through a camera and the person is alerted if any of these drowsiness symptoms are detected.

C Face Detection:

In facial detection using Haar feature-based cascade classifiers is a way to find an effective object proposed by Paul Viola and Michael Jones in their paper, "Rapid Object Detection uses a Boosted Cascade of Simple Features" in 2001. It is a machine learning machine in which the cascade function is trained from many good and bad images. It is also used to find objects in other images. Here we will work on finding the face. Initially, the algorithm requires a lot of positive images (facial images) and negative images (facial images) to train the distinction. After that we need to remove the features from it. For this, the features of Haar shown in the image below are used. They are similar to our decision kernel. Each element is the same number obtained by subtracting the total number of pixels under the white square and the sum of the pixels below the black square.

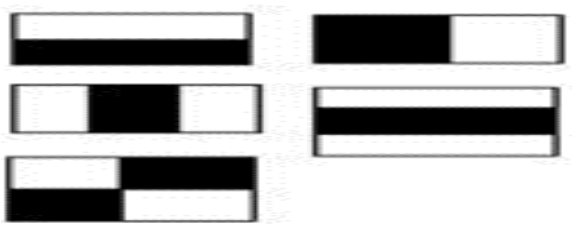


Figure 2: Haar Classifier

D Eye Detection

The system has used facial landmark prediction for eye detection Facial landmarks are used to localize and represent salient regions of the face, such as:

- Eyes
- Eyebrows
- Nose
- Mouth
- Jawline

Facial expressions have been used successfully for facial alignment, head measurement, facial swipe, blink detection and much more. In the case of facial expressions, our goal is to detect important facial features on the face using make-up prediction methods. Finding facial markers is therefore a two-step process:

- Localize the face in the image.
- Detect the key facial structures on the face ROI.

A face photo is made with custom Haar-based cascade classifiers discussed in the first step of our algorithm namely, face detection. Find key facial features in facial ROI: There are a variety of facial expressions, but all methods are actually trying to locate and label the following facial regions:

- Mouth
- Right eyebrow
- Left eyebrow
- Right eye
- Left eye
- Nose

A notable facial detector installed in the dlib library is the introduction of One Millisecond Face Alignment and Ensemble of Regression Trees paper by Kazemi and Sullivan (2014).

This method starts by using:

A training set of labelled facial landmarks on an image. These images are manually labelled, specifying specific (x, y)-coordinates of regions surrounding each facial structure.

Priors, of more specifically, the probability on distance between pairs of input pixels. The pre-trained facial landmark detector inside the dlib library is used to estimate the location of 68 (x, y)-coordinates that map to facial structures on the face. The indexes of the 68 coordinates can be visualized on the image below:

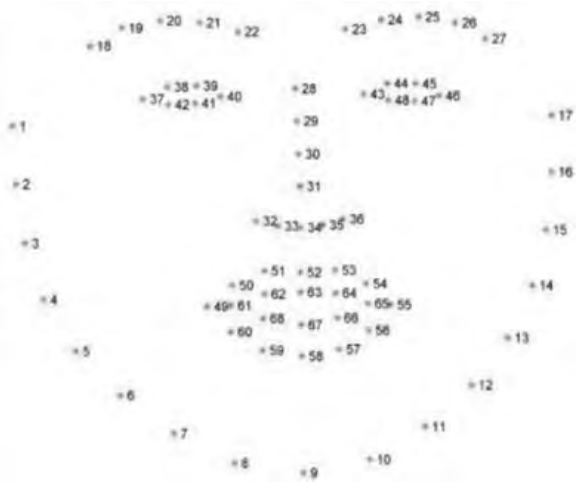


Figure 3: 68 Facial landmarks

It can detect and access both the eye region by the following facial landmark index show below

- The right eye using [36, 42].
- The left eye with [42, 48].

These annotations are part of the 68-point iBUG 300-W dataset which the dlib facial landmark predictor was

trained on. It's important to note that other flavors of facial landmark detectors exist, including the 194-point model that can be trained on the HELEN dataset. Regardless of which dataset is used, the same dlib framework can be leveraged to train a shape predictor on the input training data.

E Recognition of Eye's State:

The eye area can be measured from visual flow, with minimal follow-up or frame-to-frame intensity and flexible blocking. And finally, the decision is made whether the eyes are covered or not covered with the eyes. A different approach is to enter the eye- opening position from a single image, as e.g. by matching open and closed eye templates, horizontal or vertical image predictions of the eye region, parametric model suitable for eyebrows, or active shape models. The main problem with the previous methods is that they often impose very stringent requirements on the setting, in the sense of face-facing camera position (head direction), image correction, brightness, movement power, etc. use green image firmness can be very sensitive without real-time performance.

Therefore, we propose a simple but effective algorithm for detecting blinking of the eyes using a recent visual detector on the face. The maximum number of single eye indicators is 11 based on landmarks. Finally, by having a sequence of each eye opening measurement, the blink of an eye is detected by an SVM separator that is trained in the blink and non-blink pattern patterns. Eye rate calculations In all video frames, landmarks are available. The aspect ratio of the object (EAR) between its height and width is calculated.

$$EAR = \frac{\|p2-p6\|+\|p3-p5\|}{2\|p1-p4\|}$$

Where p1, . . ., p6 are the 2D landmark locations, depicted in Fig.4.

The EAR remains constant when the eye is open and close to zero while closing the eye. He is a man and his head is unsympathetic. The size of the open eye measure has little variation between individuals, and is fully consistent with the same image measurement and plane rotation of the face. Since the blink of an eye is done in both eyes harmoniously, the EAR of both eyes is measured.

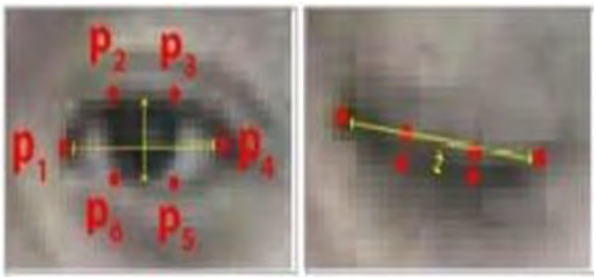


Figure 4: Open and closed eyes with landmarks

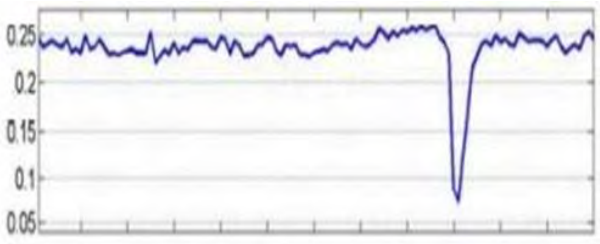


Figure 5: Eye Aspect Ratio

F. Eye State Determination:

Finally, the decision of the eye state was made in accordance with the EAR listed in the previous step. If the distance is zero or close to zero, the eye condition is classified as "closed" otherwise the eye condition is known as "open".

G. Eye Closure Detection:

The eye related parameters used to detect drowsiness in the proposed system are namely eyelid closure, gaze detection and blink rate monitoring. A square wave has been used to recognize the different states of the eye. A logical 1 and 0 are respectively used to signify input of frames and otherwise. The following block diagram briefly depicts the algorithm involved.

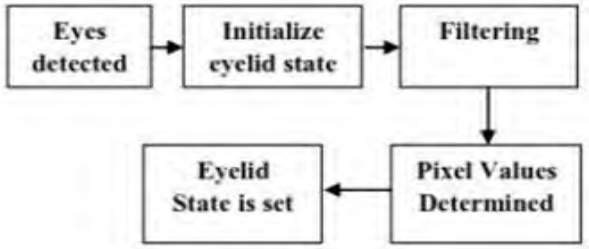


Figure 6: Eye Closure Detection

H. Drowsiness Detection:

The last step of the algorithm is to determine the person's condition based on a pre-set condition for drowsiness. The average blink duration of a person is 100-400 milliseconds (i.e., 0.1 - 0.4 of a second). Hence if a person is drowsy his eye closure must be beyond this interval. We set a time frame of 5 seconds. If the eyes remain closed for five or more seconds, drowsiness is detected and alert pop regarding this is triggered.

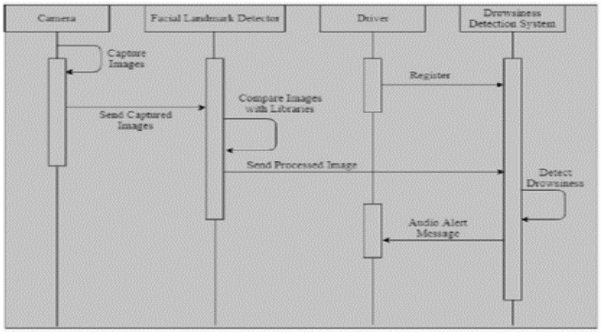


Figure 7: Sequence diagram

IV EXPECTED OUTCOME

Once the eyes are located, the system will calculate the Eye Aspect Ratio (E.A.R) and the E.A.R of each eye is averaged. If the averaged E.A.R is close to zero the eye state will be classified as closed. Further if the close eye state persists for more than 5 seconds, an alert pop is triggered stating drowsy condition.

V CONCLUSION

The Getting Down program is able to keep a close eye. A driver- based blindfold program can separate the blink of an eye from sleep, and get drowsy while driving. The proposed system can prevent accidents due to sleep while driving. The system will also work well even if drivers wear clear glasses even under low light conditions when the camera emits better. Details about the shape of the head and eyes are obtained by using various image processing algorithms.

The Haar Cascade separator reduces computer complexity in the proposed system. The system can also check the inclination of the left and right head to some degree. During monitoring, the system will be able to determine whether the eyes are open or closed. When the eyes are closed for too long, a warning will be issued. Processing determines the level of driver awareness on the basis of continuous blinding.

VI FUTURE SCOPE

In future this system can be used to detect the yawning and the rotation rate of vehicle steering wheel which are also main direction to improve the system accuracy.

VII. REFERENCES

[1] Facial Features Monitoring for Real Time Drowsiness Detection. Manu B.N Independent Researcher, India. (ICRCICN 2016)

[2] Detection of Drowsiness based on HOG features and SVM classifiers. Leo Pauly, Deepa Sankar. Division of Electronics Engineering School of Engineering Cochin University of Science and Technology Kochi -682022, Kerala, India. (ICRCICN 2015)

[3] Bill Fleming, “New Automotive Electronics Technologies”, International Conference on Pattern Recognition, pp. 484-488, December 2012.

[4] Ann Williamson and Tim Chamberlain, “Review of on-road driver fatigue monitoring devices”, NSW Injury Risk Management Research Centre, University of New South Wales, , July 2013.

[5] E. Rogado, J.L. García, R. Barea, L.M. Bergasa, Member IEEE and E. López, February, 2013, “Driver Fatigue Detection System”, Proceedings of the IEEE International Conference on Robotics and Biometics, Bangkok, Thailand.

[6] Boon-Giin Lee and Wan-Young Chung, Member IEEE, “Driver Alertness Monitoring Using Fusion of Facial Features and Bio-Signals”, IEEE Sensors Journal, VOL. 12, NO. 7, July 2012.

[7] Burcu Kır Savaş, Yaşar Becerikli, “Real Time Driver Fatigue Detection Based on SVM Algorithm”, IEEE, October 2018.

[8] Mohsen Babaeian, Mohammad Mozumdar, “Driver Drowsiness Detection Algorithms Using Electrocardiogram Data Analysis”, IEEE international journal 2019.

[9] Puja Seemar, Anurag Chandna “Drowsy Driver Detection using Image Processing”, IJESRT, July 2017, pp. 234 – 242.

This page is kept blank intentionally

Automatic Number Plate Recognition System

Khushi Shetty
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
khushisiya6@gmail.com

Vaishnavi Shetty
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
vaishu.shetty013@gmail.com

Shikha Singh
Department of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
shikhasingh4934@gmail.com

***Abstract*—Automatic Number Plate Recognition (ANPR) is a kind of image processing technology for recognizing the vehicle number plate. This system also offers users to place, mark out and monitor moving vehicles automatically by extracting their number plates. It also plays an important role in intelligent traffic control system. The proposed technique is built on morphological operations based on different structuring elements in order to exclude uninterested region and improve object area. The main aim of this paper is to understand the algorithm of Automatic number plate recognition (ANPR) system. It is based on an efficient and accurate skew and slant correction of license plates, and works together with boundary (frame) removal of license plates.**

Keywords— Automatic Number Plate Recognition; Character Segmentation; Character Recognition; Template Matching

I. INTRODUCTION

Automatic Number Plate Recognition or ANPR is a technology that uses pattern recognition to 'read' vehicle number plates. In simple terms ANPR cameras 'photograph' the number plates of the vehicles that pass by violating the rules. This 'photograph' is then fed in a computer system to find out details about the driver and owner of the vehicle and details about the vehicle itself. Computer vision and character recognition, algorithms for number plate recognition play a vital role in the recognition of the number plate [1]. The proposed system uses an optical character recognition (OCR) device, which is used to read character from the image of number plate. It consists of a camera or frame grabber that captures an image of a vehicle and finds the location of the number plate. And then identify the characters according to character recognition tool to convert into numerically identified character. Automatic Number plate recognition system finds wide varieties of applications to fit itself beyond just controlling access to a toll collection point or parking lot. [2].

II. LITERATURE SURVEY

P.Sai Krishna in a paper titled "Automatic Number Plate Recognition by Using Matlab" mentioned about the methodology which is divided into three major parts namely pre-processing, text localization and extraction and text/non- text classification. In the pre-processing step, the coloured input image is converted to grey scale image. The image is then binrised and filtering is applied to remove any noise if present. The suggested method is tested with various types of vehicles with different background and different climatic condition. The test has been performed on 20 number plates of different vehicles in different climatic conditions and got 18 successful outputs. Success rate of this project is 90% [3].

Tran Duc Duan's paper Building an Automatic Vehicle License-Plate Recognition System mentioned about the methodology of their proposed system. The system consists of four modules: Pre-processing, VLP (Vehicle License- Plate) detection, character segmentation, and optical character recognition (OCR), in which the last three modules deal with three main problems of a VLP recognition domain. The VLP detection module receives images which have been processed by the preprocessing module. The segmentation module segments plate-images into separate character-images. These character-images are then recognized by the OCR module and the final results are ASCII characters and numbers in plates. The success rate in the VLP Detection is 98.76%. The success rate in the Segmentation is 97.61%. The success rate in the OCR is 97.52%. Therefore the success of the whole system is 92.85% [4].

Shyang-Lih Chang, Li-Shien Chen, Yun-Chung Chung, and Sei-Wan Chen in a paper titled "Automatic License Plate Recognition" mentioned about the methodology consisting of two main stages: locating license plates and identifying license numbers. In the experiment on locating license plates, 1088 images taken from various scenes and under different conditions. Of which, 23 images have been failed to locate the license plates present in the images; the license plate location rate of success is 97.9%. In the experiment on identifying license number, 1065 images, from which license plates have been successfully located, were used. Of which, 47 images have been failed to identify the numbers of the license plates located in the images; the identification rate of success is 95.6%. Combining the above two rates, the overall rate of success for the LPR algorithm is 93.7% [5].

Zoe Jeffrey in a paper titled "Automatic number plate recognition system on an ARM-DSP and FPGA heterogeneous SoC platforms" mentioned about the complete system, an embedded standalone,

intelligent and capable of capturing and processing license plates on board the device and represents an advance on the traditional commercial The overall results achieved show that the entire ANPR algorithm can be implemented on a single FPGA. The success rate of number plate localization is 97.8% with a speed of 4.7 ms. Accuracy of Character segmentation was 97.7% with a speed of 1.4 ms. As per the article the future work should concentrate on improving the speed of the algorithms and getting the input of the image in different conditions. Overall success rate of FPGA resources is 80% with a speed of 10ms [6].

Sarabjit Kaur's "An Automatic Number Plate Recognition System under Image Processing" stated about the algorithm of the ANPR system. The proposed approach for automatic number plate recognition system works well for low contrast, noisy and blurred as well as dark and light/bright input images. Total 120 vehicle's images are tested. The success rate of number plate extraction is 90%.Accuracy of Character segmentation was 90%.Character segmentation stage of ANPR was found to have 86.67% accuracy. Images are taken in different illumination conditions. The future research of ANPR should concentrate on high definition plate image processing, multi-style plate recognition, and multi-plates processing at a time, video based ANPR using temporal information and recognition of ambiguous characters and so on [7].

P. Surekha's "Automatic license plate recognition using image processing and Neural network" stated that ALPR system consists of an image acquisition system and a character prediction network. The system was tested on a set of 105 static images as well as in a dynamic environment. 102 samples were successfully predicted with the efficiency of 97%. The system could be capacitated to capture images from a large distance and at wider skewed angle. ALPR system should have the ability to predict multiple license plates when multiple vehicles are present on a single frame [8].

Dimo Todorov Dimov in a paper titled "Adaptive License Plate Image Extraction" mentioned about the License Plate Localization (LPL) component of a ANPR system, which works with single frame gray-level images, obtained at different daytime and weather conditions, as an input. Extensive testing has been conducted with more than 150 Israeli and Bulgarian vehicles. Images have been captured from various distances and viewing angles. Image size has varied from 64K to 1M pixels. The true license plate zone was correctly located and approved on more than 90% of the images. The rest of the cases were rejected by one of the consistency tests. The goal of the research is to investigate the possibility to create a comprehensive system for multinational vehicle identification based on the license plate recognition. In that case no additional hardware such as transmitters mounted on the vehicle or additional sensors are required. results could be obviously extended to other applications in the input-output transport systems.[9]

Kuo-Ming Hung and Ching-Tang Hsieh's A Real-Time Mobile Vehicle License Plate Detection and Recognition stated about the multilayer neural network which is used to achieve character recognition. In the acquired 257 sample images, the samples deemed success are 228, and 29 are deemed failure. The rate of successful recognition is 88.71%. The result shows that the recognition success rate is approximately between 89% and 91% when the car speed is between 0 and 40. This system will perform multiple LP detection during a time period. This will increase the accuracy rate of the LP detection and recognition under inferior environment.[10]

Kumar Parsuraman in his journal titled "An Efficient Method for Indian Vehicle License Plate Extraction and Character Segmentation " mentioned about the major stages, which are: RGB to gray-scale conversion, vertical edge detection and image binarization, analysis and dilation, vertical projection and thresholding, extracting the accurate location of the license plate, filtration and image enhancement, binarization and smoothing process, and Character segmentation for horizontal and vertical. This method has been tested over a large number of images with size of 368 x 254 pixels in order to analyze its performance. It segregates character in 95% accuracy. It is implemented in IDL 7.0. The performance of the test results demonstrate that the proposed method is efficient to be used for the license plate recognition system. The proposed method is mainly designed for real-time Malaysian license plate and can be readily extended to cope with license plates of other countries, especially those using Latin characters.[11]

Marimuthu Palaniswami 's Segmentation of Characters on Car License Plates mentioned about a six-layer cascaded classifier to increase the detection speed, in which the first two layers are based on global features and the last four layers are based on local Haar-like features. In this license plate detection rate is 96.4%. Furthermore, their system can detect and recognize a 648*486 license plate image in real- time and within 0.2 seconds on a PC with Pentium 2.8GHz CP. Optimization of the algorithms to be carried out in the future [12].

III. PROPOSED DESIGN

The proposed algorithm of automatic number plate recognition is divided into following steps: (a) taking picture from the vehicle, (b) processing the image, (c) character extraction from the number plate, (d) character segmentation, (e) character matching, (f) identify the number plate, (g) output. The typical flow diagram of the system is shown in Figure 1

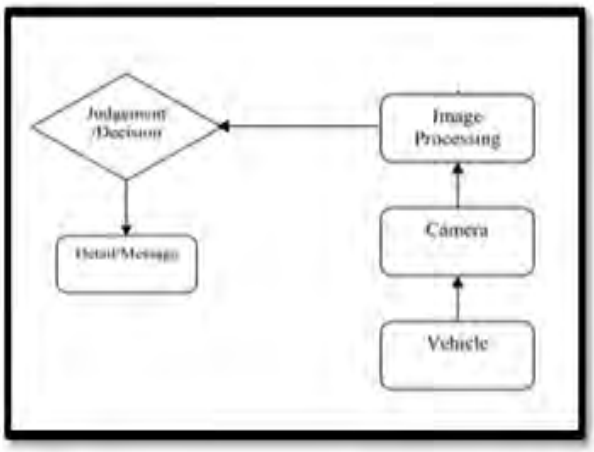


Figure 1: Basic block diagram of ANP

In the proposed system, a camera is installed for collecting an image. An automatic method is followed for analysis and recognizes the number plate within an estimated time under existing illumination condition. It performs the two major task:

(a) Number plate number location using canny detector
(b) Recognition of number plate with template matching to identify each and every character (A to Z), numerical value (0 to 9) and making a separate sign ('-').

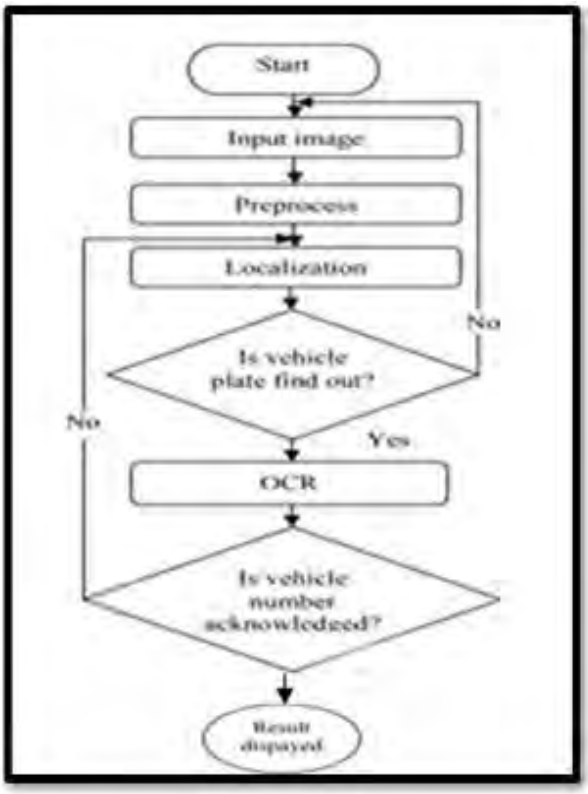


Figure 2: Algorithm Design of ANPR

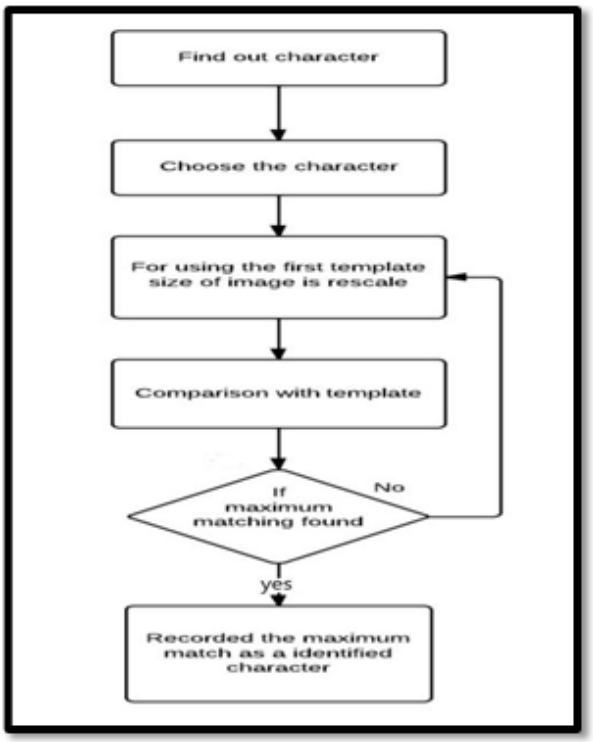


Figure 3: Flow Chart for Template Comparison

IV. RESULT AND DISCUSSION

A Survey was conducted regarding the project. Basic description of the project was mentioned at the top. Total 53 people have expressed their opinions. Responses received were from different age groups and organizations. They were recorded and the following data gives information about it.

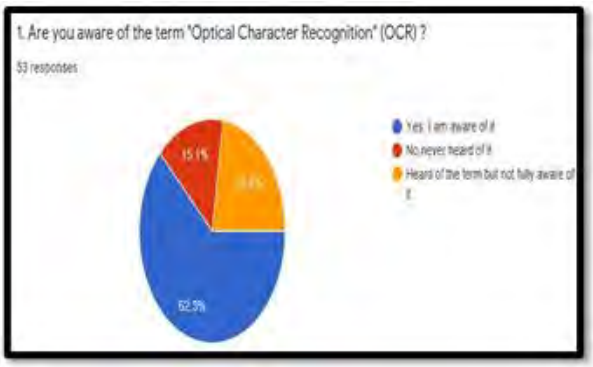


Figure 4: Survey response chart 1

As per the records, most of the people were familiar with the term "Optical Character Recognition". Few had heard about it, but not fully aware of the term while some of them never heard of it.

Basic questions regarding the advantages of ANPR were included in the survey. Most of the people were in favour of the advantages.

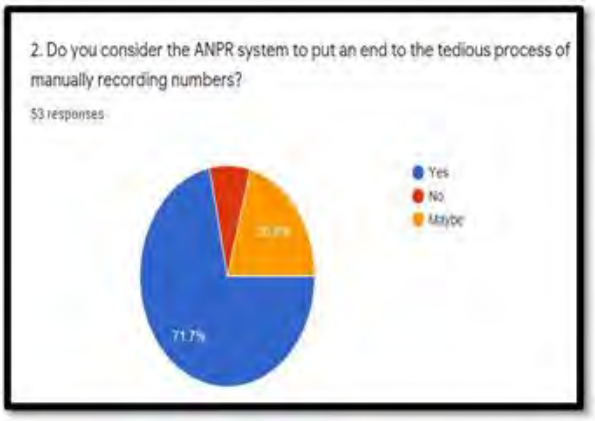


Figure 5: Survey response chart 2

As per Figure 5, 71.7% of the people agreed that the ANPR system will put an end to the tedious process of manually recording numbers while 20.8 % were still in doubt regarding it. Few of them did not agree with the rest.

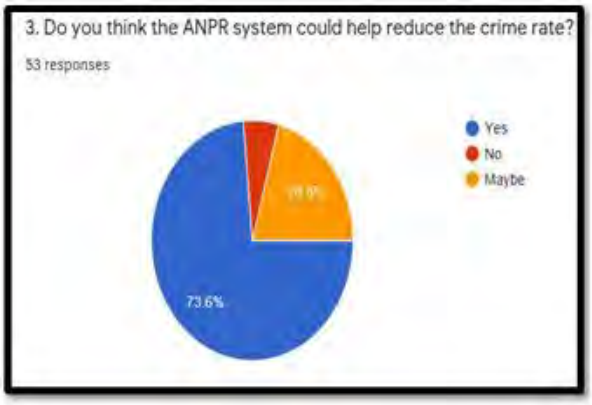


Figure 6: Survey response chart 3

As per Figure 6, 73.6% believed that the system could help in reducing crime rates while 20.8% were unsure and the others did not think it would help in crime rates.

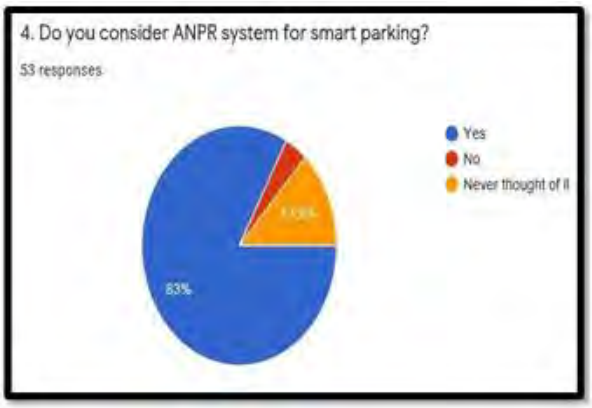


Figure 7: Survey response chart 4

In Figure 7, 83% of the people considered ANPR system for smart parking whereas 13.2% never thought about it. Very few disagreed with the idea of smart parking.

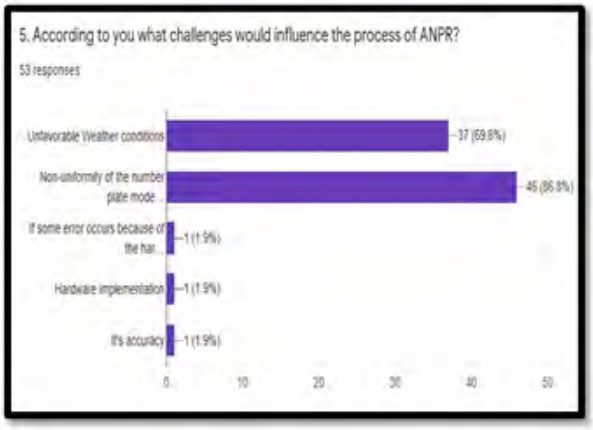


Figure 8: Survey response chart 5

The majority thought that the non-uniformity of the number plates and unfavorable weather conditions in different cities could influence the process of the ANPR system. Some of them thought about the hardware implementation and its accuracy.

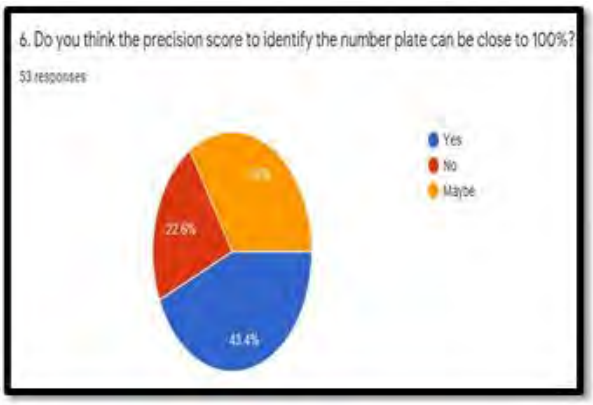


Figure 9: Survey response chart 6

As per the above response, mixed reviews were received regarding whether the product, would give 100% accuracy or not. 43.4% believed it would give close to 100%, whereas
34% believed it might give close to perfect accuracy while the others disagreed.

Figure 10: Survey response chart 7

50.9% of the people would recommend our product to the local police while 45.3% would recommend if it is implemented correctly.

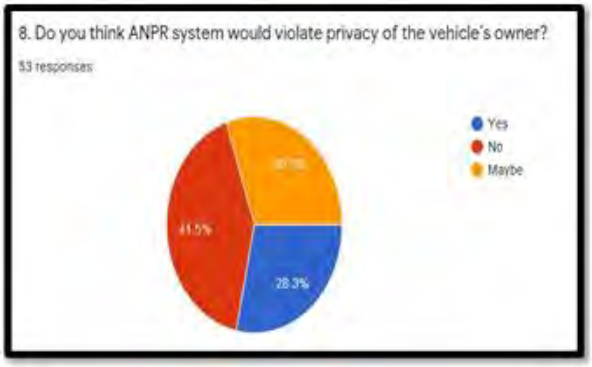


Figure 11: Survey response chart 8

As per Figure 11, 41.5% of the people were positive that it would not violate privacy of the vehicle's owner while 30.2% thought it might compromise the privacy. Other's believed it would violate privacy.

In the survey, it was mentioned to give their ideas regarding the implementation and their suggestions for improvement to which few people responded that proper handling of low resolution images should be done. An app can be developed which can keep track of the data. Most of them said that uniformity of the number plates should be taken care of, characters must be recognized accurately to avoid false accusations in police investigation and the system should be authentic and useful for authorized means.

V. CONCLUSION

This report has discussed the development of an automatic license plate recognition system. The objective of the report is to understand the process of automatic number plate recognition system. It's need and usage in the future. Our aim is to provide high quality image and extreme accuracy. This project helps eliminate the tedious process of manually recording the numbers. It focuses on developing the ANPR system to detect fast moving cars from captured image using strong algorithm and deep learning to the existing ANPR applications.

REFERENCES

[1] P.Meghana, S. SagarImambi, P. Sivateja, K. Sairam, Image Recognition for Automatic Number Plate Surveillance. February 2019
[2] Ganesh R. Jadhav, Automatic Vehicle Number Plate Recognition for Vehicle Parkin Management System , Electronics and Telecommunication Engineering Department, SKN Sinhgad college of engineering, Pandharpur , India , Vol.5, No.11, 2014
[3] P. Sai Krishna, , Automatic Number Plate Recognition by Using Matlab, Dept. of Electronics and Communications Engineering, Andhra University College of Engineering, 2015 IJIREC, Vol 2,Issue 4,June 2015
[4] Tran Duc Duan, Tran Le Hong Du, Tran Vinh Phuoc, Nguyen Viet Hoang, Building an Automatic Vehicle License-Plate Recognition System, Department of Computer Science, RIVF'05, February 2005
[5] Shyang-Lih Chang, Li-Shien Chen, Yun-Chung Chung, and Sei-Wan Chen Automatic License Plate Recognition, Senior member IEEE, IEEE trasaction on intelligent transportation, Vol 5, no 1, March 2004
[6] Zoe Jeffry,Xiajun Zhai, Faycal Bansali, Automatic number plate recognition system on an ARM-DSP and FPGA heterogeneous SoC platforms, University of Hertfordshire, Hatfield, UK , HC25 California , Aug 2013
[7] Sarbjit Kaur, An Automatic Number Plate Recognition System under Image Processing, College of engineering and management Kapurthala, India, MECS Vol.8, No.03,2nd March 2016
[8] P. Surekha, S. SagarImambi, P. Sivateja, Automatic license plate recognition using image processing and Neural network. Department of electrical and electronics engineering,India, IJIVP Vol 8,no.4, February 2018
[9] Dimo Dimo Todorov Dimov Adaptive License Plate Image Extraction. Bulgarian academy of sciences, CompSysTech'2003, January 2003
[10] Kuo-Ming Hung and Ching-Tang Hsieh A Real-Time Mobile Vehicle License Plate Detection and Recognition, Department of Information management, Kainan University, Tamkang Journal of Science and engineering Vol 13, No.4, 2010
11] Kumar Parasuraman An Efficient Method for Indian Vehicle License Plate Extraction and Character Segmentation, Member IEEE, IEEE International Conference on computational intelligence and computing research,2010
[12] Marimuthu Palaniswami Segmentation of Characters on Car License Plates, University

This page is kept blank intentionally

Product Price Prediction using Machine Learning with Image Processing

Aamir Kazi
Electronics and Telecommunications
Thakur College of Engineering and Technology
Mumbai, India
aamszk@gmail.com

Pearl Kothari
Electronics and Telecommunications
Thakur College of Engineering and Technology
Mumbai, India
pearlkothari8@gmail.com

Niyati Morkhiya
Electronics and Telecommunications
Thakur College of Engineering and Technology
Mumbai, India
nhm0999@gmail.com

***Abstract* - Artificial Intelligence is an integral part of all major e-commerce companies today. With the evolution of the information industry and extensive research in the field of AI in the past two decades, businesses have started to explore the ways to automate various activities using state of the art Machine Learning algorithms and Deep Neural Networks.**

Many IT giants and start-ups have already taken a big leap in this field and have dedicated teams and resources for research and development of cutting-edge AI applications. Online retail platforms today are extensively driven by AI-powered algorithms and applications. Activities ranging from inventory management and quality checking at the warehouse to product recommendation and sales demographics on the website, all employ machine learning at various scales. This work aims at creating price prediction model for different products using deep learning networks. We create database for our product using web scraping and then build an image comparison model to compare for similar looking products in the database and thus predict the price based on different product features.

Keywords – Sales Prediction, Image Similarity, Neural Networks, Machine learning .

I. INTRODUCTION

The work is built to provide users a portal that is very easy to use and helps the user to predict their product market rate.

We use web scrapping which is very important tool in today's world it helps to create database by scraping the data from the website of our choice. We have created our web scraping code which helps us to generate enormous data from the e-commerce website. Project also has image comparison model that helps to compare the base image with all the other images. The model performs feature comparison that compares smallest details and changes in the product image. The ability to find a similar set of images for a given image has multiple use-cases from visual search to duplicate product detection to domain specific image clustering.

Price prediction plays an important role in product launch as a thorough market analysis needs to be done for a particular product so that it can undercut the market pricing without sacrificing the margin and also providing more product traction and thus attracts more customers leading to higher sales.

II. LITERATURE SURVEY

Online shopping is quickly becoming the norm, but the experience differs greatly from retail shopping, in which people have the opportunity to closely examine a product, weighing in the feel of a material or the scent of a cream before making a purchase decision. Online shoppers must rely entirely on the few product images to make a decision. Madhuvanthi.K, Nallakaruppan.M.K , Senthilkumar N C, Siva Rama Krishnan S have presented a the methodology of analytic hierarchy process in order to get variety of idea about how well the various criteria in our dataset works and after this we apply the machine learning algorithms such as Linear Regression [1]. Parasich Andrey Viktorovich, Parasich Viktor Aleksandrovich, Kaftannikov Igor Leopoldovich, Parasich Irina Vasilevna have shown that the competitor's goal was to predict house's sale price by their attributes like house area, year of building, etc. In our solution, we use classic machine learning algorithms, and our original methods, which will be described here. [2]. Keiron O'Shea and Ryan Nash have proposed one of the most impressive forms of ANN architecture is that of the Convolutional Neural Network (CNN). CNNs are primarily Used to solve difficult image-driven pattern recognition tasks and with their precise yet simple architecture, offers a simplified method of getting started with ANNs.[3]. Jiang Wang, Yang Song, Thomas Leung, Chuck Rosenberg,,Jingbin Wang, James Philbin, Bo Chen, Ying Wu proposed a deep ranking model that employs deep learning techniques to learn similarity metrics directly from images. It has higher learning capability than models based on hand-crafted features. An efficient triplet sampling algorithm is proposed to learn the model with distributed asynchronous stochastic gradient. [4].G.Nag a Satish,Ch.V.Raghavendra, M.D.Sugnana Rao, Ch.Srinivasulu have discussed the prediction of future housing prices that is generated by machine learning algorithms. We utilize lasso regression as our model because of its adaptable and probabilistic methodology on model selection. It has the ability to process predictions that would be comparative with other house costprediction models. [5]. Akshay Krishna, Akhilesh V, AnimikhAich, Chetana Hegde to predict the sales of a retail store using different machine learning techniques and trying to determine the best algorithm

suited to our particular problem statement. We have implemented normal regression techniques and as well as boosting techniques in our approach and have found that the boosting algorithms have better results than the regular regression algorithms. [6].
These models can be used by both buyers and sellers to suggest fair prices for products, or warn of inaccurate or unreasonable pricing. In this work, we also visualize which features tend to result in predicted higher or lower prices.Our proposed model can help sellers increase the perceived value of their products, helping guide product design and photo selection to improve a buyers impression.

III. Proposed System

Here, we build, optimize, and evaluate an array of machine learning models that can predict prices based on product images, for both regression and classification tasks.

Price Prediction with Image Comparison project is divided into three major parts:
1.WEB scraping:

Web scraping is a process of automating the extraction of data in an efficient and fast way. With the help of web scraping, you can extract data from any website, no matter how large is the data, on your computer.
Moreover, websites may have data that you cannot copy and paste. Web scraping can help you extract any kind of data that you want.When you extract web data with the help of a web scraping too, you would be able to save the data in a format such as CSV. You would then be able to retrieve, analyze and use the data the way you want. Hence,web scraping simplifies the process of extracting data, speeds it up by automating it and creates easy access to the scrapped data by providing it in a CSV format.Web scraping is done by using BeautifulSoup library designed for python.In computer programming, a library is a collection of script modules, like commonly used algorithms, that allow being used without rewriting, simplifying the programming process. with simple commands, Beautiful Soup makes sense of site structure and helps parse content from within the HTML container. It is considered the most sophisticated and advanced library for web scraping.
When we run the code for web scraping, a request is sent to the URL that we have mentioned. As a response to the request, the server sends the data and allows us to read the HTML or XML page. The code then, parses the HTML or XML page, finds the data and extracts it.
To extract data using web scraping with python, we need to follow these steps:

1. Find the URL that we want to scrape
2. Inspecting the Page
3. Find the data we want to extract
4. Write the code
5. Run the code and extract the data
6. Store the data in the required format

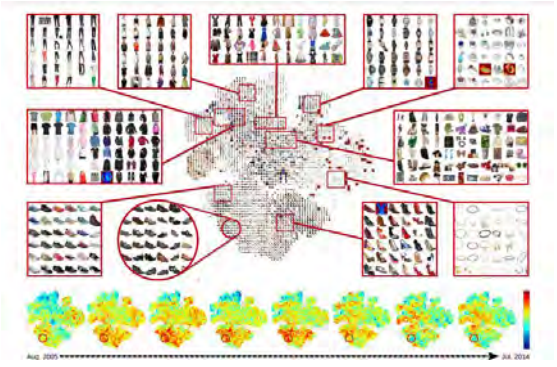


Fig 1. Collection of data

Random forests regressor is an ensemble learning method for classification, regression and other tasks that operate by constructing a multitude of decision trees at training time and outputting the class that is the mode of the classes (classification) or mean/average prediction (regression) of the individual trees. Random decision forests correct for decision trees' habit of overfitting to their training set. Random forests generally outperform decision trees, but their accuracy is lower than gradient boosted trees. However, data characteristics can affect their performance. We use three different metrics to evaluate and compare the performance of our models on price regression: root mean squared error (RMSE), mean absolute error (MAE),
and coefficient of determination (R2). RMSE measures the
root average squared error between the predicted and actual
price qPmi=1(y(i) − yˆ(i))2, while MAE is interpreted as the average absolute difference in price Pmi=1y(i) − yˆ(i).
Lower values are better for both. Coefficient of determina-
tion measures the proportion of variance explained by the
model, and lies between 0 and 1, where higher values are better.We split our datasets into training and testing splits, which are consistent across all models to ensure fair comparison. To create the split for both datasets, we first shuffle, then assign 90 percent of the points to train, and the remaining 10 percent to test. The training algorithm for random forests applies the general technique of bootstrap aggregating, or bagging, to tree learners. Given a training set $X = x_1, \ldots, x_n$ with responses $Y = y_1, \ldots, y_n$, bagging repeatedly (B times) selects a random sample with replacement of the training set and fits trees to these samples:

For $b = 1, \ldots, B$:

1. Sample, with replacement, n training examples from X, Y; call these X_b, Y_b.
2. Train a classification or regression tree f_b on X_b, Y_b.

After training, predictions for unseen samples x' can be made by averaging the predictions from all the individual regression trees on x':

This bootstrapping procedure leads to better model performance because it decreases the variance of the model, without increasing the bias. This means that while the predictions of a single tree are highly sensitive to noise in its training set, the average of many trees is not, as long as the trees are not correlated. Simply training many trees on a single training set would give strongly correlated trees (or even the same tree many times, if the training algorithm is deterministic); bootstrap sampling is a way of de-correlating the trees by showing them different training sets.Additionally, an estimate of the uncertainty of the prediction can be made as the standard deviation of the predictions from all the individual regression trees on x':

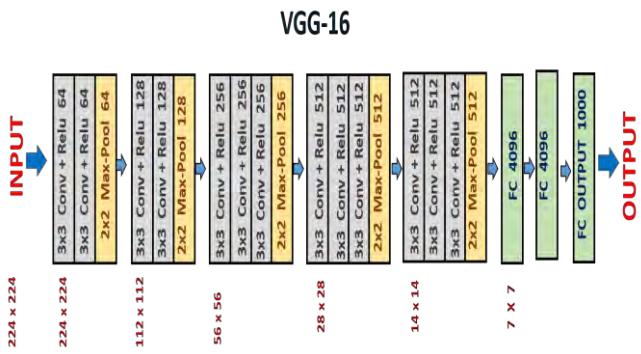
The number of samples/trees, B, is a free parameter. Typically, a few hundred to several thousand trees are used, depending on the size and nature of the training set. An optimal number of trees B can be found using cross-validation, or by observing the *out-of-bag error*: the mean prediction error on each training sample x_i, using only the trees that did not have x_i in their bootstrap sample.[15] The training and test error tend to level off after some number of trees have been fit.

2. Image classification:

VGG-16 is used for training on ImageNet and the trained final model will be used in Image-embedding.Image-embedding is a process which reads image and uploads them to a remote server. It offers several embedders, each trained for a specific task. This is used for calculating similarity index.

Here, a custom deep learning architecture is used for image classification with several classes such as rings, pendants, earrings, bracelets. When a user is testing it, the user gives a certain input , the trained classification model is used to identify the user image and then the similarity testing is performed.

VGG is an acronym for the Visual Geometric Group from Oxford University and **VGG-16** is a network with 16 layers proposed by the Visual Geometric Group. These 16 layers contain the trainable parameters and there are other layers also like the Max pool layer but those do not contain any trainable parameters.



3. Image comparison:

The data collected from web scraping is stored as dataset, when the input image is given to the model we need to compare the features and the product type with all the different category of data available in the database. For this we do image comparison which is done using Convolutional Neural Network(CNN). This is used to verify that whether the user has entered proper category type as per the image. We also use deep ranking models to efficiently compare the minute features of the model. The deep ranking model is basically trained using the approach of triplet. A triplet contains a query image, a positive image, and a negative image, where the positive image is more similar to the query image than the negative image.

By training our model using machine learning approach we will get the most similar images to our input image.

Fig 2 : Query input from the user and it's output

Our first deep CNN is trained using transfer learning. In particular, we use the pretrained ImageNet object recognition networks VGG-16 .VGG-16 is a very deep convolutional neural network consisting of many layers of small convolution and pooling filters, followed by two fully connected layers and a softmax output.

VGG16 is an ImageNet CNN that uses separable depth-wise convolutions for higher efficiency. For both models, we use the Keras framework, load the architecture and weights, and remove the networks' softmax and dense layers. We set the remaining layers to be fixed, and add our own fully connected layer. We use two different output layers, each designed for a specific task. For continuous regression, we add a single linear activation output unit after the fully connected layer.

4. Price Prediction:

Price prediction is done using KNN. The KNN algorithm assumes that similar things exist in close proximity.The KNN algorithm hinges on this assumption being true enough for the algorithm to be useful. KNN captures the idea of similarity (sometimes called distance, proximity, or closeness). Once the value of K is decided ,that is how many nearest neighbours we want, accordingly the output efficiency will vary. After this the model will give us the price to be kept for our product.

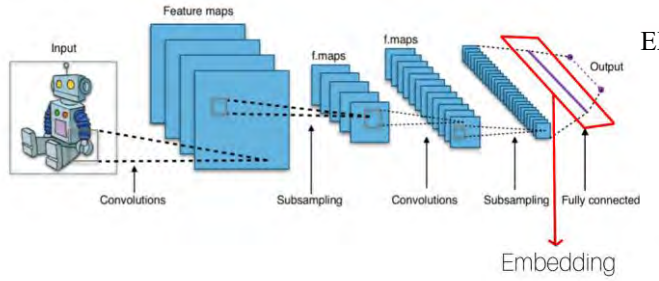
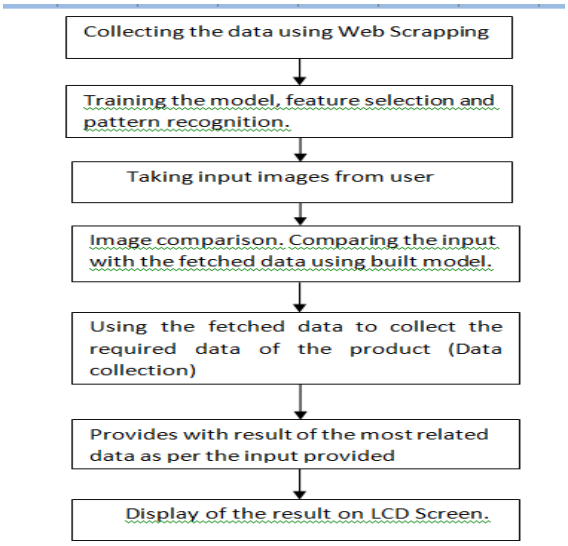


Fig 3: Model Architecture

IV. SIMULATION AND EXPECTED RESULTS

SIMULATION



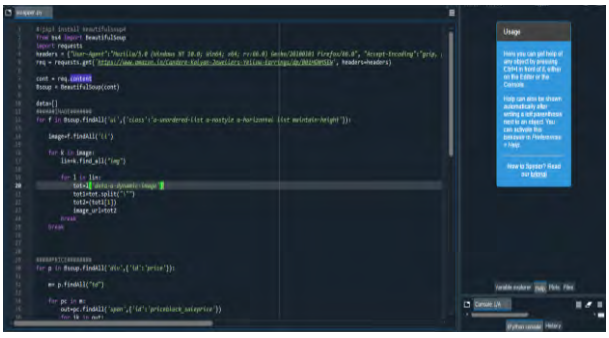


Fig 4 : Code for extracting Data

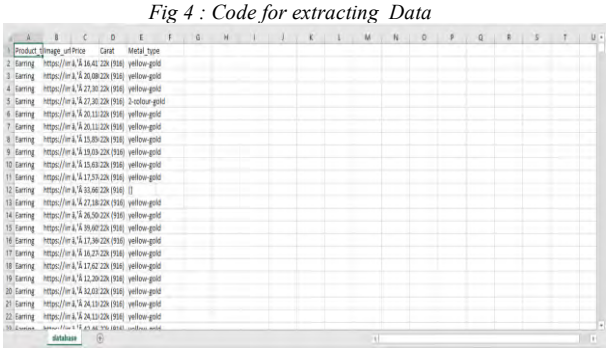


Fig 5 : Database

EXPECTED RESULT

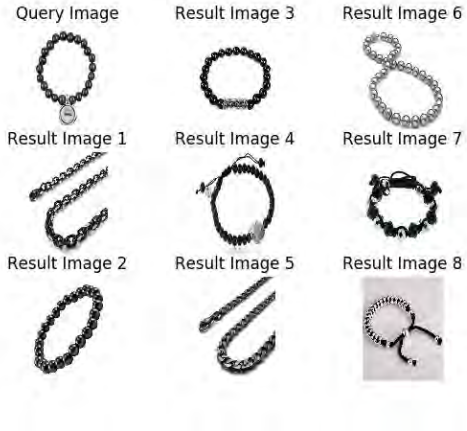


Fig 6 : Scanned input from the user and it's output

V. RESULT AND DISCUSSION

This project used WEB Scrapping to collect and analyse data(images, patterns) available on various E-commerce sites for the product and created a database of the information. An ML Model was created using the collected data and it was trained using various image processing techniques. The input is then compared to the database and the most accurate output of the product is displayed along with its market price. In the end, using Linear Regression the cost price of that product is predicted using the data collected by WEB Scrapping.

VI. CONCLUSION

As the Internet has grown astronomically and businesses have become increasingly dependent on data, it is now a compulsion to have access to the latest data on every given subject. Data has become the basis of all decision-making processes whether it's a business or a non-profit organization. To make proper use of this available data and find some meaningful information out of it is what our project aims at achieving. After scraping the sites and gathering the dataset we then performed machine learning algorithms that gives us the require output from a huge amount of data. Machine learning that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves. The process of learning begins with observations or data, such as examples, direct experience, or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers learn automatically without human intervention or assistance and adjust actions accordingly.The machine learning algorithms helps us to make a very efficient

model to compare the images and also predict the price of our product.

VII. FUTURE WORK

We have identified multiple future real-world applications. Using feature visualization, sellers can determine what features of objects are correlated to higher prices, and use this to help guide design. Our model can also be extended to assist valuations, such as for used car sales, where prices are difficult to determine. Finally, our model can be applied to auction sites such as eBay for recommendations of starting bids, and provide a tool to individuals for choosing better photo quality when selling products online.

REFERENCES

[1]Madhuvanthi.K, Nallakaruppan.M.K , Senthilkumar N C, Siva Rama Krishnan S, "Car Sales Pediction Using Machine Learning," Int. J. of Innovative Technology and exploring Engineering, ISSN:2278-3075 vol-8 ISSUE 5 March 2019.

[2]Parasich Andrey Viktorovich, Parasich Viktor Aleksandrovich, Kaftannikov Igor Leopoldovich, Parasich Irina Vasilevna, "Predicting Sales Prices Of Houses," IEEE-2018, ISBN:978-1-5386-7531-1.

[3]Keiron O'Shea and Ryan Nash, "An Introduction to Convolutional Neural Networks," Issue November 2015.

[4]Jiang Wang, Yang Song, Thomas Leung, Chuck Rosenberg,,Jingbin Wang, James Philbin, Bo Chen, Ying Wu "Learning fine-grained Image Similarity with Deep Ranking", 2014 IEEE Conference on Computer Vision and Pattern Recognition, doi 10.1109/CPVR.2018.180.

[5]G.Nag a Satish,Ch.V.Raghavendra, M.D.Sugnana Rao, Ch.Srinivasulu, "House Price Prediction Using Machine Learning," Int. J. of Innovative Technology and exploring Engineering(IJITEEE), ISSN:2278-3075 vol-8. ISSUE 9 July 2019.

[6]Akshay Krishna, Akhilesh V, AnimikhAich, Chetana Hegde, "Sales-forecasting of Retail Stores using Machine Learning Techniques,"3rd IEEE International Conference on Computational Systems and Information Technology for Sustainable Solutions 2018 , ISBN:978-1-5386-6078-2.

This page is kept blank intentionally

Melanoma Cancer Detection using Deep Learning

Mukul Gupta
Electronics & Communication Department
Thakur College of Engineering and Technology Mumbai,India

Hardika Jain
Electronics & Communication Department
Thakur College of Engineering and Technology Mumbai,India

Adwait Raut
Electronics & Communication Department
Thakur College of Engineering and Technology Mumbai,India

***Abstract*— This paper addresses the deep learning based classification model that is used for classifying the melanoma cancer. Skin cancer has been a wide concern of medical disease and having an efficient and robust self-learned model for helping detecting them in early stages will be very useful. The model in this paper is trained on very extensive dataset and was validated to have a high accuracy for prediction. The model used the concept of transfer learning and creating our model by it.**

Keywords—deep learning, transfer learning, melanoma Cancer.

I. INTRODUCTION

In recent years there is been in increase in various Cancer disease and major increase has happened in Skin Cancer. This increase in Cancer diseases is due unhealthy lifestyle followed by many in today's generation. Melanoma Skin Cancer is the most common skin Cancer among all and it's increasing at rapid pace. There has been a previous successful attempt to classify the skin cancer by the image as the data set by using various machine learning classification algorithms like SVM (Support Vector Machine). These algorithms give high accuracy and results, but in recent years due to a vast increase in data set collection and abundance of labeled data there has been rise of use of neural network architecture for classification and prediction problems. Neural nets are considered to be providing a very high accuracy compared to previous known classification algorithms. Just as there is rise in data the concept of deep learning has started to evolve where there is very large number of neural network layers which even helps in having better accuracy. But there is a tradeoff between better accuracy with computational cost and time, since the motivation of the new techniques is reduce the cost and time needed for the given problems we need to find another ways to it.

There has been a lot of work done in Deep learning for image classification problems. There is world renowned architecture that provides best classification results which were trained using very powerful GPU and was found at very high computational cost. The neural nets work in way where they find patterns in given inputs and generalize their outputs. In image classification problems a lot of basic patterns are common among all types of images e.g. Vertical edges, horizontal edges, and if a model is already trained for finding this pattern then we needs to use this pre trained model and make modification in last layers as per the need of problem definition. This is called Transfer Learning. Transfer learning is the concept where we use pre-trained model which was used for some other problem definition and then make some fine tuning to this architecture to use it for our problem definition. In deep learning it's found that early layers try to find basic patterns in the data set e.g. In image of any type the early layers of any model try to find edges which is common task for all kind of images. So using this pertained models parameters weight we can change or remove last layers (also called as head layers) and run few epoch to make model to learn the parameters for head layers and then we can also add some classification layers(softmax layer) as per our problem statement.

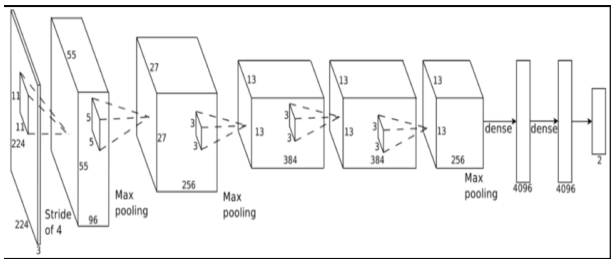
This paper we have used the concept of transfer learning and we have use RESNet and fine-tuned as per the problem statement. This helps in reducing the computational cost of training the model and with marginal effect on results and accuracy's

II. METHODOLOGY

AlexNet:-

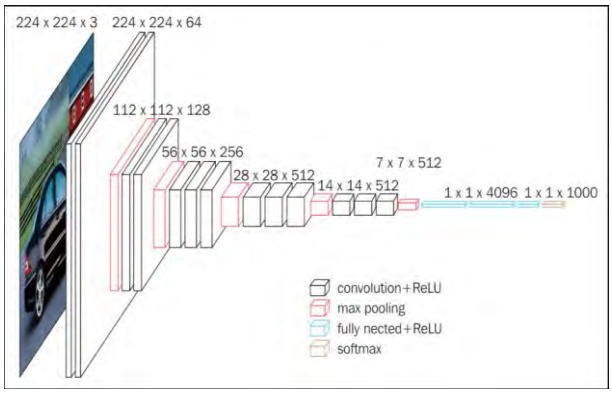
AlexNet proposed by Krizhevsky et al., where this net possesses many essential characteristics, such as the following:

1. There are many more filters with every layer, which able to enhance features and reduce noise.
2. Each stacked convolution layer is followed by a pooling layer which able to reduce the number of features and extract essential features only.
3. The likelihood of gradient vanishing reduced because of using RELU as activation function instead of tanh, logistic, arctan, or Sigmoid, which is more biological inspired.
4. From the previous three points, the AlexNet is five times faster than other deep architectures.
5. Some deep architecture required specific hardware; AlexNet can work well with hardware and GPU limitations.



Deep architectures contain more than a hidden layer. These hidden layers help to enhance and extract features in a better way. AlexNet is a big network consisting of several neurons equal to 650,000 and 60 million parameters. The activation function was the first improvement. For nonlinearity in the classical neural network, the activation function limited to arctan, tanh, logistic function, etc. The gradient values using these activation functions will be significant only when the input is around small range 0, so these types of activations functions will fall into the problem of gradient vanishing. A new activation function called a rectified linear unit (ReLU) had been used to overcome this problem. If the input is not less than 0, the gradient of RELU is always 1. Also, it accelerates the training process. Features are extracted automatically by the convolutional layers and reduced by the pooling layer.The model will able to learn from image features by convolution, and these parameters are shared to reduce the complexity of the model. The pooling layers used to reduce the extracted features. The pooling layers take a group of neighboring pixels from the feature map and generating values for representation. Max pooling is used in AlexNet to reduce the feature map.The classification was done in the fully connected layers. Softmax was used in the fully connected layers as an activation function.
In our case we have taken 300 images consisting of both melanoma and not melanoma. Using ImageDataGenerator() function the images have been sorted directly into train_data and valitation_data. These images are feed to the model and passed through 5 convolutional layers and 3 fully connected layers and in the end for decision making through a softmax layer. The optimizer used in case of gradient descent here is SGD(Sohastic Gradient Descent) which decreases its learning rate gradually as we approach the optimum. In our case total trainable parameters in network are 62,407,486. Based on experience and to cover all 300 images we have taken 40 steps per epoch and 5 epochs

VGG16:
The VGG16 network is a convolutional neural network model comprises 16 convolutional layers with 3x3 filter size, five max-pooling layers with 2x2 window size. A heap of convolutional layers is followed by three fully connected layers. It consists of five convolutional blocks; first two blocks have two convolutional layers and one max-pooling layer. Remaining three blocks have three convolutional layers and one max-pooling layer. The Input of first convolutional block is 240x240x3. Output of first block is 120x120 x 64 that is 64 channels. This feature map is fed into the input of second block and so on. For the coming blocks output is reduced half the size and the channel size is doubled. The final feature map produced by fifth block of size 7x7x512.Fully connected classifier has 3 layers and the first fully connected (Dense) layer have 4096 outputs, second fully connected (Dense) layer have 1000 outputs, the third (Dense) layer performs classification and it contains 2 output.



Major drawbacks with VGGNet:

1) It is painfully slow to train.
2) The network architecture weights themselves are quite large (in terms of disk/bandwidth).

In our case we have taken 300 images consisting of both melanoma and not melanoma. Using ImageDataGenerator() function the images have been sorted directly into train_data and valitation_data. These images are feed to the model and passed through 12 convolutional layers and 3 fully connected layers and in the end for decision making through a softmax layer. The optimizer used in case of gradient descent here is SGD(Sohastic Gradient Descent) which decreases its learning rate gradually as we approach the optimum. In our case total trainable parameters in network are 83,937,090. Based on experience and to cover all 300 images we have taken 40 steps per epoch and 5 epochs.

III. EXPERIMENTAL RESULTS

Dataset:
Experiments are achieved to evaluate the method on a public challenge dataset of Melanoma Cancer detection released on kaggel.com. The challenge consists of three parts Part 1, part 2 and part 3. The 1st Part consists of training data, 2nd Part consists of cross-validation data, 3rd Part consists of test data. The experiment is carried out with 201 dermoscopic images taken from part1 as training image for segmentation with ground truth. Another 100 images from part 2 is held out as cross validation dataset for segmentation. From the 300 segmented images 66.66% of the images are used as training data for classification. Remaining 33.33% images held out as cross validation data to predict the result.

Performance Metrics:

For performance measurement, the proposed work is evaluated using Accuracy, Sensitivity and Specificity. These metrics are defined in terms of the number of True
Positives (TP), True Negatives (TN), False Negatives (FN) and False Positives (FP). True Positive (TP) means:

$$\text{Sensitivity} = \frac{TP}{TP+FN}$$

Specificity shows that the non-disease patient has a negative result that is the percentage of non-melanoma people who are identified exactly as healthy.

$$\text{Specificity} = \frac{TN}{TN+FP}$$

Accuracy shows the possibility of the correct determination that is the percentage of patients and healthy people who are diagnosed correctly.

$$\text{Accuracy} = \frac{TP+TN}{TP+TN+FP+FN}$$

AlexNet:
For implementation of Alex-Net we have used input dimensions of 175x175x3. This is applied to first layer with kernel size of 11x11 and stride size of 4x4 and maxpooling of "same" category. For second layer a kernel size of 5x5 and stride size of 1x1 with 256 filters is used. Third layer uses 384 filters and kernel of 3x3 and stride of 1x1. Fourth layer is equivalent to third layer. Fifth layer is identical to second layer. Rest of the layers are fully connected layers. All the layers except to last layer use "RELU" activation. Last layer uses "SIGMOID" activation. There are total of 62401486 trainable parameters involved. Learning rate of 0.001 is used in optimizer. This network is implemented using Sohastic Gradiend Descent (SGD) optimizer. After trying the network on this dataset we have learned to set for 40 steps per epoch and in total of 5 epochs. For this setting we have achieved final training accuracy of 98.97% and cross-validation accuracy of 95.83%.

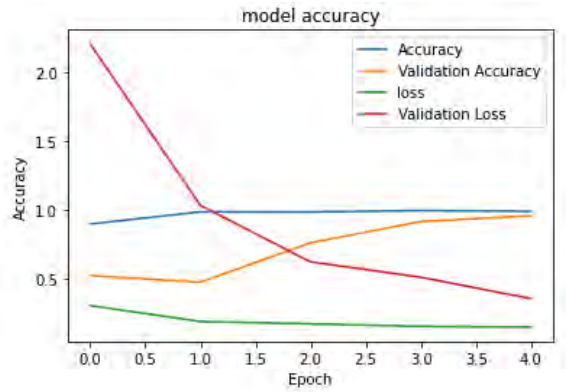


Fig 1: AlexNet output

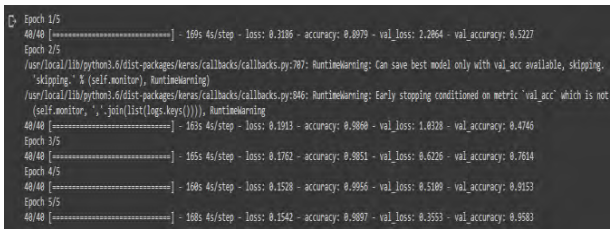


Fig 2: Per epoch accuracy

VGG16:
For implementation of VGG-16 we have used input dimensions of 175x175x3. This is applied to first layer with kernel size of 3x3 and 64 filters. For second layer similar parameters are set. Third layer is of 128 filters and same kernel size. Then we consistently increase the filter sizes with every two layers to 256 the to 512 and so on. Lastly last 3 layers are fully connected layers. All the layers except to last layer uses "RELU" activation function. Last layer is of "SIGMOID" activation.
The total of 83937090 trainable parameters involved.
Learning rate of 0.001 is used in optimizer. This network is implemented using Sohastic Gradient Descent (SGD) optimizer.

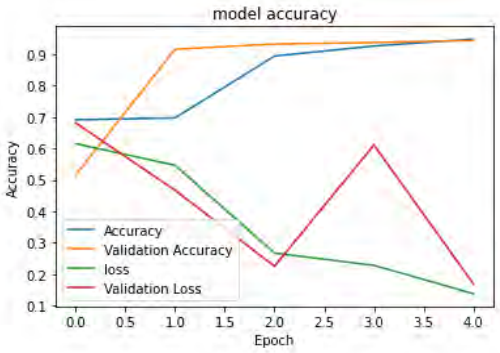


Fig 3: VGG16 output

IV. CONCLUSION

In this paper, a Deep Neural Net and CNN based segmentation and classification to achieve the challenges of automated melanoma classification in dermoscopy images, which consists of three steps: Segmentation, Feature Extraction and Classification. Here we had used AlexNet and VGG16 architecture and can compare the results obtained. AlexNet being more versatile and best suited for classification purpose gave the best results.VGG16 even though after having more layers and deep network could not deliver outstanding results owing to the fact that this network is best suited for image segmentation purpose. Also the training time taken by each network affect its performance, AlexNet was the one which could be trained much faster and VGG16 owing to its size was much harder to train. Overall AlexNet proved to be a better architecture and choice when it comes to melanoma cancer detection.

V. FUTURE SCOPES

AlexNet even though has proved to be better than VGG16 but it still is very expensive to compute on large dataset. With the use of complex Neural Net algorithms like ResNet-50 we can achieve high accuracy through deeper networks without trading off training time. Also with better pre-processing we can achieve higher accuracy.

REFERENCES

[1] G. Eason, B. Noble, and I. N. Sneddon, "On certain integrals of Lipschitz-Hankel type involving products of Bessel functions," Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955. *(references)*

[2] J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.

[3] I. S. Jacobs and C. P. Bean, "Fine particles, thin films and exchange anisotropy," in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.

[4] K. Elissa, "Title of paper if known," unpublished. [5] R. Nicole, "Title of paper with only first word capitalized," J. Name Stand. Abbrev., in press.

[6] Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, "Electron spectroscopy studies on magneto-optical media and plastic substrate interface," IEEE Transl. J. Magn. Japan, vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].

[7] M. Young, The Technical Writer's Handbook. Mill Valley, CA: University Science, 1989.

Better Public Spaces for All

Vaibhav Kapse
Electronic & Telecommunication Department
Thakur College of Engineering & Technology. Kandivali (East), Mumbai- 400101
vaibhavkapse32@gmail.com

Yaseen Khan
Electronic & Telecommunication Department
Thakur College of Engineering & Technology. Kandivali (East), Mumbai- 400101
khanyaseentehsin@gmail.com

Sahil Kakanj
Electronic & Telecommunication Department
Thakur College of Engineering & Technology. Kandivali (East), Mumbai- 400101
sahilmaheshwari66@gmail.com

***Abstract*— Public Places play an important role in social life of people. These are the places where communities are formed. These places helps in economic development. Hindi sage people doesn't explore public places around them. Also people from rural areas doesn't know about the public places in the area where this stay. The project proposed in this paper will try to address this problem. The product of this project will be an application which will provide suggestions regarding the public places according to the user reference the crowding levels at that place. It will make use of fuses location for determination of crowding level. The Application will learn about movement pattern of the user and provide suggestion according to it. It will make use of machine learning models and data mining for prediction purpose. It is expected that this application will be e useful to the people and make better decision regarding which public place to go.**

Keywords— data mining, machine learning Introduction

I. INTRODUCTION

Public spaces play a vital role in the social life of communities. They are locations where community comes alive, where bonds among neighbours are strengthened and where a sense of belonging is fostered. They are locations that spark economic development and drive environmental sustainability. As in this day and age people are more sticking to their smart phones, laptops and don't try to explore places around them. Cities of people coming from rural areas as well as other states in search of opportunities, but they don't have no place to stay or spend time. The project described in this paper try to solve the problem of this people. This paper will describe about the project and how this project will help this people to find better public places and explore them.

II. LITERATURE SURVEY

A. Users Next Location Recommendation Using Data Mining. [1]

In this paper they have talk about various algorithm such as Support Vector Machine (SVM) with Radial Basis Function (RBF) kernel. In Decision Tree (DT) as trajectory classifier. There are two parameters that are considered: C and gamma while training SVM with RBF. There are possibility of complex tree while using decision tree algorithm. If the number of features is much greater than the number of samples. Also, SVMs do not directly provide probability estimates, which are desirable in most classification problems

B. Exploring Human Movement Behaviour Based on Mobility Association Rule Mining of Trajectory Traces [2]

They have proposed framework which extracts movement behavioural rules from accumulated GPS l og of mobile users. In the future, they also aim to assimilate other contextual information such as weather information, traffic information and extend the present framework.

C. Modeling of Human Movement Behavioral Knowledge from GPS Traces for Categorizing Mobile Users [3]

They have proposed a framework to model individuals' movement patterns, analyzing human movement patterns both from semantic and spatio-temporal context and extracting implicit information. In the future, they would like to extend features of the system to analyze indoor movements and scale up the system to incorporate different methods for activity learning or behavioral pattern mining

D. Machine Learning Algorithms for Recommender System - a comparative analysis [4]

They have compared various machine learning algorithm such as naïve bayes, K- means , content based etc and compared there precison rate on movie lens data set In the future, they are trying to test the machine learning algorithm which offer high accuracy real time sophisticated recommendation systems.

E. Location Prediction using Trajectory data [5]

They have introduced the basic concepts of location prediction, the different types of data sources, the challenges associated with location predictions and the location prediction framework. Also categorized location-prediction models. In the future, they are trying to include correlating spatial and temporal information in the location prediction systems

III. METHODOLOGY

This project consists of an application which will provide interface to the user. Application will consists of the user registration and login screen. After login user will be go to the main page the page will consist of button which will help you to find public places nearby. Application will also have option to get the suggestion about the public places according to the mood. Application will require location permission to track the user and to provide suggestion. There will be a main system which will handle all the user data. It it will be connected to the Google Maps to provide the location of the public places. The system also will be have a database of all the public places. It will also felt the information about the weather from the weather forecast to determine if public place is safe to visit or not.

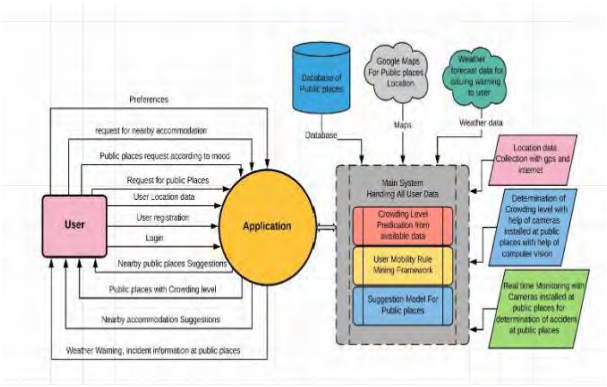


Figure 1 :- Proposed system data flow diagram

Application will provide the location data of the user to the main system for prediction of crowding level at public places. There will also be a camera installed it new popular public places for crowding level prediction. The data from both the location of the users and from the cameras can be used for providing accurate prediction of crowding. This this camera installed near the public places will also be used for real-time monitoring of accident occurrence with the help of computer vision and will call emergency services accordingly. The system will consist of user mobility rule mining framework and public place suggestion model. This user Mobility Rule Mining Framework will take the user location log and will form Mobility rules which will help the system to predict the next location of the user, this in turn will help to provide better suggestions.

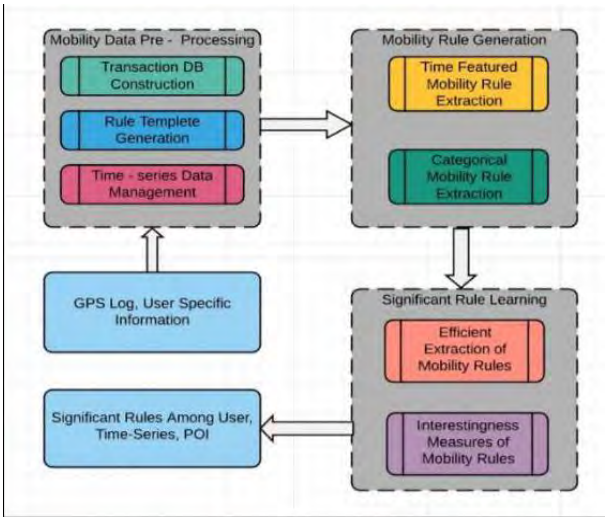
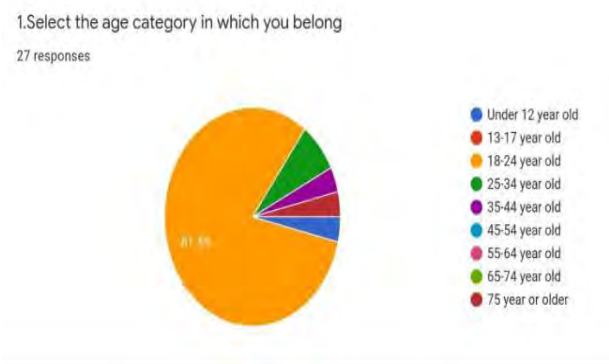
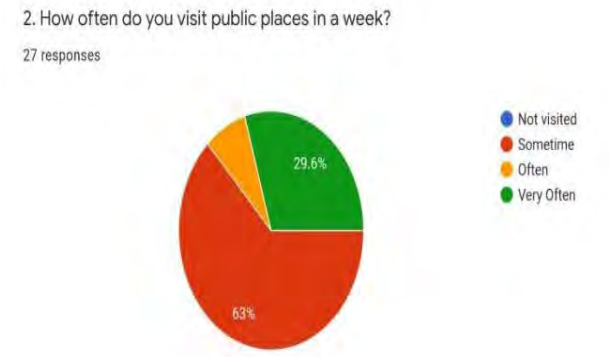
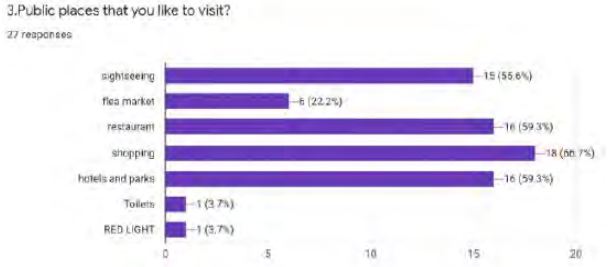


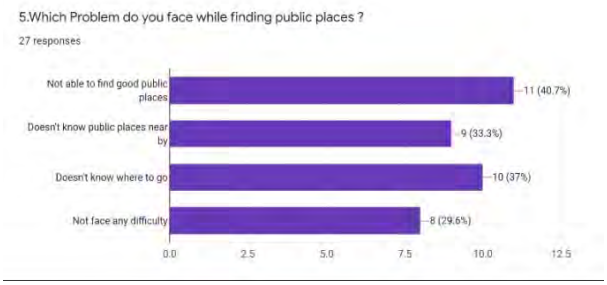
Figure 2:-Architecture of mobility rule mining framework

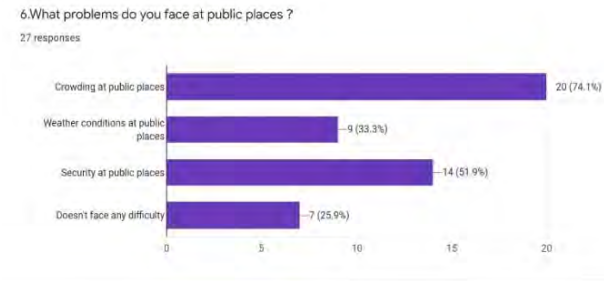
IV. SURVEY

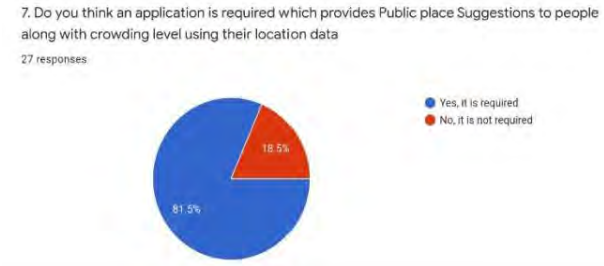


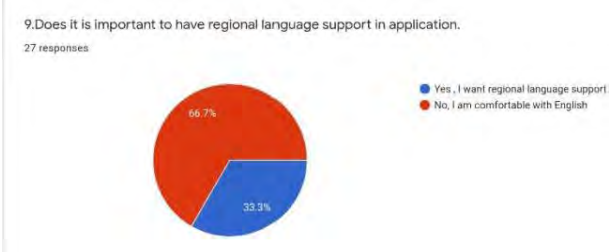


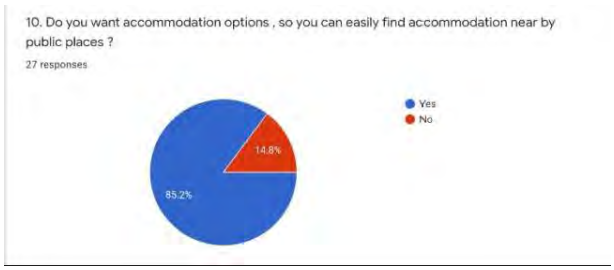


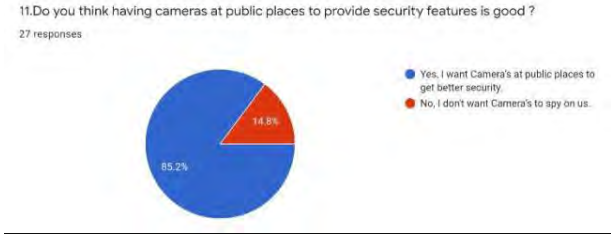












V. RESULTS

This applications will be helpful to people who come doesn't know much more about their area. The system will be able to provide better public places to the people by providing them information about the crowding level, accidents near the public places. It is expected that people will use the application get the suggestions about the public places.There will be an emergency tab in application which will tell about the dangerous situation near that public places for example It will alert the user if there are high tides at the beaches. It will help you out to decide whether to go or not at a particular public places. With the help of cameras installed at certain public Places it will call the emergency services if there is An occurrence of accident .This application will also suggest the Accommodation to the user in the nearby area. These are some of the advantages of our system compared to the existing solution.

VI. CONCLUSION

Public places plays an important role in social life of peoples. This are the place where communities come together and form bonds. People from outside the cities doesn't know about the public places in area where they resides. This people find it difficult to search for public places. Application proposed will help this people to find the public places. It will tell the user about the crowding level as well as accidents at the public places. The system installed at public places when there is occurrence of accident public place and issues warning to the users. This will provide better and safer public places to the people according to their preference. In future we can get access to the security cameras at street to provide accident detection and make public places safer for people.

REFERENCES

[1] Anisha Sharma (PG Student), Sanjeev Ghosh (Associate Professor) Journal of Emerging Technologies and Innovative Research (JETIR) , June

[2] Shreya Ghosh, and Soumya K. Ghosh, International Conference on Intelligent Systems Design and Applications, March 2018

[3] .Shreya Ghosh, and Soumya K. Ghosh, International Conference on Intelligent Systems Design and Applications, March 2018

[4] Satya Prakash, International Journal of Computer Applications Technology and Research Volume 6–Issue 2, 97-100, 2017, ISSN:-2319–8656

[5] Ruizhi Wu, Guangchun Luo , Junming Shao, Ling Tian, and Chengzong PengBIG DATA MINING AND ANALYTICS ISSN 2096-0654 02/06 pp108–127 Volume 1, Number 2, June 2018

Waste Segregation Using Image Processing

Bhavik Bhatt
Electronics & Telecommunication
Thakur college of engineering & Technology
Mumbai, India
bhavik8941@gmail.com

Aditya Wadikar
Electronics & Telecommunication
Thakur college of engineering & Technology
Mumbai, India
adityawadikar18@gmail.com

Yash Yadav
Electronics & Telecommunication
Thakur college of engineering & Technology
Mumbai, India
yashkumaryadav99@gmail.com

***Abstract*— "Automated Domestic Waste Segregator using Image processing" proposes a smart waste sorting system for domestic level which consists of hardware and a software system based on image processing. The ultimate goal is to design a real time thrash can which can be used for domestic purposes. The image is captured by the camera where image is processed through M computer. The waste segregated is put inside the trash which detects the entry of waste material and camera captures the image, MATLAB compares with the feature values and sends it to raspberry pi**

Keywords—Raspberry Pi, Image Processing, Edge detection, Feature extraction

I. INTRODUCTION

This project proposes a smart waste sorting system for domestic level which consists of hardware and a software system based on image processing. Hence this project aims developing a domestic garbage separation system for household needs which can also be used in public places like schools, colleges, railway stations and airports etc. Generally domestic waste is classified into two types a) Biodegradable wastes b) Non – Biodegradable wastes. These two main classes are further classified into two categories depending on their reusability.

II. EASE OF USE

A. MATLAB

MATLAB is a proprietary multi-paradigm programming language and numerical computing environment developed by Math Works. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages

B. Biodegradable waste

Biodegradable waste is defined as the kind of substance that gets decomposed into carbon dioxide, water, methane or simple organic molecules by micro-organisms and other living things by composting or aerobic digestion

C. Non -Biodegradable waste

A Non-Biodegradable material can be defined as a kind of substance which cannot be broken down by natural organisms and acts as a source of pollution

Image Processing

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image.

III. LITERATURE SURVEY

A. Importance of waste segregation and sorting

The system was designed which can separate inorganic waste like plastic bottles, aluminum cans, plastic cutlery, and other kinds of waste. It uses knowledge from different areas like computer sciences, optics, mechanics, and electronics. The specific topics that we have focused on are image processing, computer vision, machine learning, pattern recognition, embedded systems, and circuit design. Although this proposal does not really solve the trash problem, it solves part of it by simplifying waste separation, saving money, and reinforcing the environmental culture.

B Classification of waste

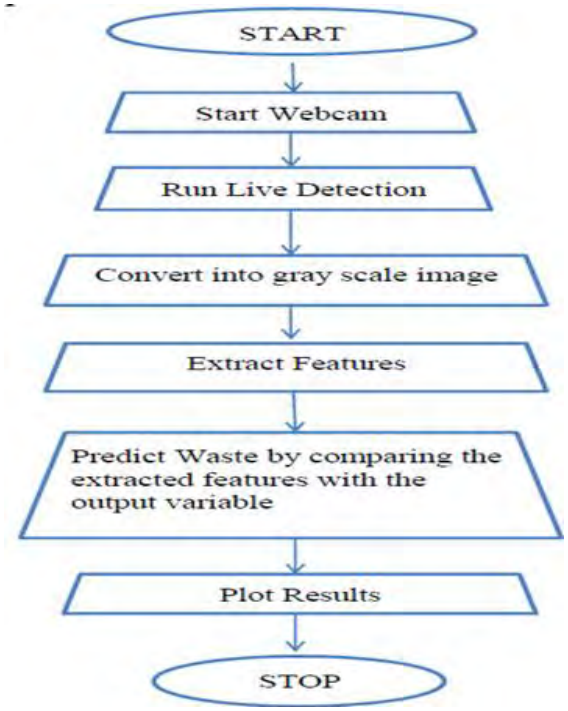
Classification of trash into various recycling categories is possible through machine learning and computer vision algorithms. One of the biggest pain point isthe wide varieties of possible data (i.e. any object can be classified into one of the waste or recycling categories). Therefore, in order to create a more accurate system, there needs to be a large and continuously growing data source.

C Automation of waste

Waste can be managed by using various automated methods like image processing which helps in reducing the manual labor and time saving

IV. SWOC ANALYSIS

V. FLOW CHART / DESIGN



VI. METHODOLOGY

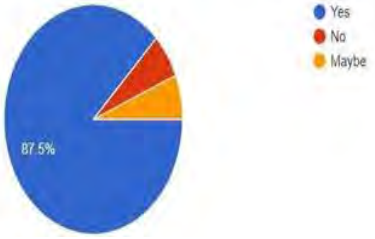
First datasets of the different waste materials are created. Then using MATLAB, the features are detected from the datasets using Feature Extraction algorithms. The detected features are stored in a bag of Variable. The variable is trained using SVM in matlab.

Once the training is completed, the output variable is stored for prediction. Start the webcam run live waste detection and get the image. Predict waste using extracted features by comparing with the stored output variable and plot the results. Initially, the waste is put into the input section and waste image is captured by the camera fixed inside the bin. The image is processed through MATLAB software in the computer. The Raspberry Pi is used to control the motor which is fixed inside the bin. Initially the waste to be segregated is put inside the trash can. The Infrared sensor detects the entry of waste materials and sends command to the Pi so that the camera gets turned on. Using the captured image, MATLAB compares with the trained images and based on the feature value it sends a command to the motor through Raspberry Pi.

The product developed can also find application in various food industries, fabrication industries and many more where all the process of segregation is involved. According to the need, the images of the materials to be segregated are fed and the algorithm is trained.

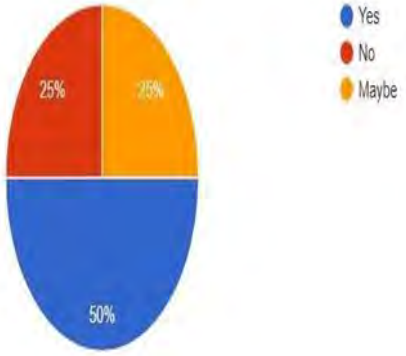
Would you be willing to purchase a waste segregation bin for your home?

16 responses



Do you know any waste segregation or recycling bins in your community

16 responses



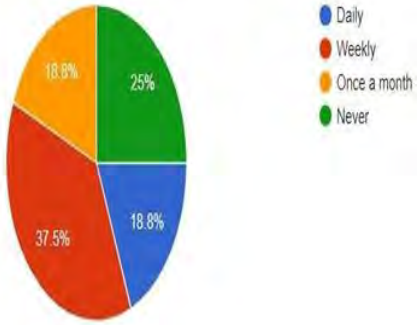
Any Suggestion or idea for improving Waste Segregation system?

16 responses

No
Government should provide it and if not followed should fine
Use image processing
Waste segregation should be done effectively
NA
Should be taught more
I think one should have knowledge about the same
Using of reusable bags
Only the WASTE to reuse

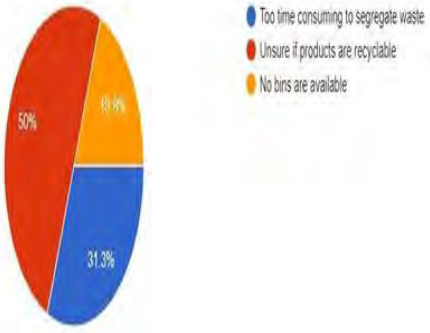
How often do you practice segregating waste in your house/college

16 responses



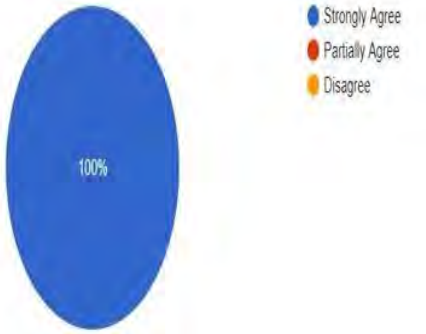
What obstacles, if any, keep you from recycling/ segregating waste ?

16 responses



Waste management is a shared responsibility to which i am, as a citizen also hold responsibility

16 responses



V CONCLUSION

Hence, the proposed system was able to easily segregate domestic wastes which were thrown individually. The bin was tested with various waste materials and is found to be effective in the segregation process. It can be used for domestic purposes and recyclable materials can be easily recovered through this project. Metallic wastes are also segregated. Besides domestic purposes, it can also be used in certain public places. Thus through this project, we are using machine learning and image processing as a tool to classify the wastes.

REFERENCES

[1] International Journal of Interactive Multimedia and Artificial Intelligence, Alvaro Salmador, Javier Pérez Cid, Ignacio Rodríguez Novelle,"Intelligent Garbage Classifier" Vol: 1, ISSN 1989-1660

[2] Jesuit University of Guadalajara, Department of Electronics, Systems and IT (ITESO) Andres Torres- García, Oscar Rodea-Aragón, Omar Longoria-Gandara, Francisco Sánchez-García, Luis Enrique González- Jiménez ."Intelligent Waste Separator "ISSN 2007- 9737

[3] Classification Of Trash For Recyclability Status- report.pdf Mindy Yang and Gary Thung "Classification of Trash for Recyclability Status"

Sign Language Recognition System

Jagdish Lohar
Electronics and Telecommunication department
Thakur College of Engineering and Technology

Rohit Pal
Electronics and Telecommunication department
Thakur College of Engineering and Technology

Vimlesh Pathak
Electronics and Telecommunication department
Thakur College of Engineering and Technology

***Abstract* - Computer recognition of sign language is an important research problem for enabling communication with hearing impaired people. This project introduces an efficient and fast algorithm for identification of the number of fingers opened in a gesture representing an alphabet of the Binary Sign Language. The system doesnot require the hand to be perfectly aligned to the camera. The project uses image processing system to identify, especially English alphabetic sign language used by the deaf people to communicate. The basic objective of this project is to develop a computer based intelligent system that will enable dumb people significantly to communicate with all other people using their natural hand gestures. The idea consisted of designing and building up an intelligent system using image processing, machine learning and artificial intelligence concepts to take visual inputs of sign language's hand gestures and generate easily recognizable form of outputs. Hence the objective of this project is to develop an intelligent system which can act as a translator between the sign language and the spoken language dynamically and can make the communication between people with hearing Impairment and normal people both effective and efficient. The system is we are implementing for Binary sign language but it can detect any sign language with prior image processing.**

Keywords - Artificial Intelligence, Binary sign Language, Image Processing, Machine learning, Template Matching

I. INTRODUCTION

Dumb people are usually deprived of normal communication with other people in the society. It has been observed that they find it really difficult at times to interact with normal people with their gestures, as only a very few of those are recognized by most people. Since people with hearing impairment or deaf people cannot talk like normal people so they have to depend on some sort of visual communication in most of the time. Sign Language is the primary means of communication in the deaf and dumb community. As like any other language it has also got grammar and vocabulary but uses visual modality for exchanging information. The problem arises when dumb or deaf people try to express themselves to other people with the help of these sign language grammars. This is because normal people are usually unaware of these grammars. As a result it has been seen that communication of a dumb person are only limited within his/her family or the deaf community. The importance of sign language is emphasized by the growing public approval and funds for international project. At this age of Technology the demand for a computer based system is highly demanding for the dumb community. However, researchers have been attacking the problem for quite some time now and the results are showing some promise. Interesting technologies are being developed for speech recognition but no real commercial product for sign recognition is actually there in the current market. The idea is to make computers to understand human language and develop a user friendly human computer interfaces (HCI). Making a computer understand speech, facial expressions and human gestures are some steps towards it. Gestures are the non-verbally exchanged information. A person can perform innumerable gestures at a time. Since human gestures are perceived through vision, it is a subject of great interest for computer vision researchers. The project aims to determine human gestures by creating an HCI. Coding of these gestures into machine language demands a complex programming algorithm. In our project we are focusing on Image Processing and Template matching for better output generation.

II. LITERATURE SURVEY

Paper Title	Author	Year of publication	Key Finding	Research Gap
A hand-pose estimation for vision-based human interfaces.	E. Ueda, Y. Matsumoto M. Lmai, T. Ogasawara.	International Conference on Computational Intelligence & Communication Technology, 2003	An estimation of joint angles by the silhouette images, hand-pose estimation using real hand images.	Not very accurate, the algorithm requires faster implementation for real-time processing
Sign Language Recognition System For Deaf And Dumb People.	Shanu Sharma, SakshiGoyal	International Conference on Intelligent Systems Design and Applications. 2013	The algorithm is working accurately for 45 types of inputs	Not made to identify gestures other than alphanumeric
An Assistive Hand Glove for Hearing and Speech Impaired Persons	Marvin S. Verdadero, Jennifer C. Dela Cruz.	Journal of Emerging Technologies and Innovative Research (JETIR) , June 2019	Able to identifyalpha numericode using hardware such as microcontroller,Arduino and sensors.	Slow speed due to hardware, Accuracy was not high.

III . PROPOSED METHODOLOGY

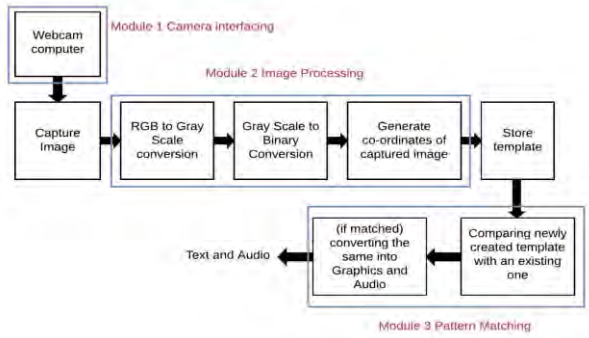
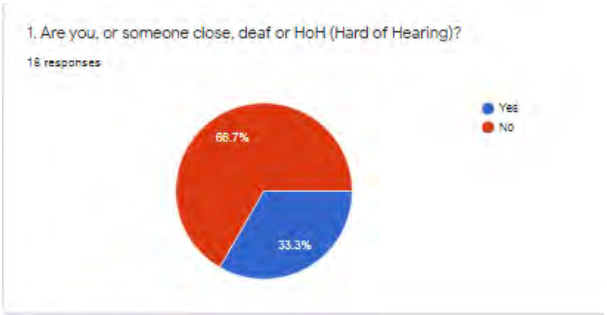


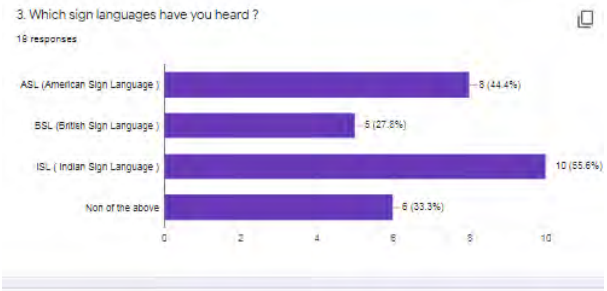
Fig 1. System diagram for proposed system.

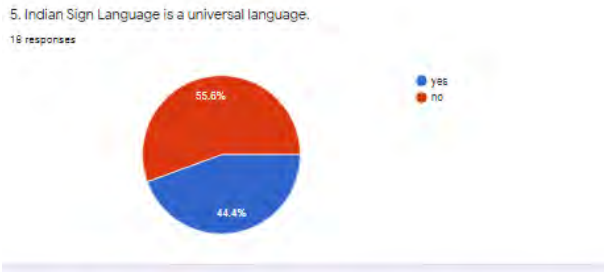
Fig 1 shows the overall idea of proposed system. The system consists of 4 modules. Image is captured through the webcam. The camera is mounted on top of system facing towards the wall with neutral background. Firstly, the captured Colored image is converted into the gray scale image which intern converted into the binary form. Coordinates of captured image is calculated with respect to X and Y coordinates. The calculated coordinates are then stored into the database in the form of template. The templates of newly created coordinates are compared with the existing one. If comparison leads to success then the same will be converted into audio and textual form. The system works in two different mode i.e. training mode and operational mode. Training mode is part of machine learning where we are training our system to accomplish the task for which it is implemented i.e. Alphabet Recognition.

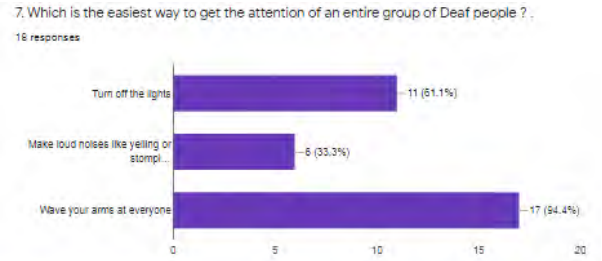
Basically, any color image is a combination of red, green, blue colors. An important trade-off when implementing a computer vision system is to select whether to differentiate objects using colour or black and white and, if colour, to decide what colour space to use (red, green, blue or hue, saturation, luminosity)[1]. For the purposes of this project, the detection of skin and marker pixels is required, so the colour space chosen should best facilitate this. The camera available permitted the detection of colour information. Although using intensity alone (black and white) reduces the amount of data to analyze and therefore decreases processor load it also makes differentiating skin and markers from the background much harder (since black and white data exhibits less variation than colour data). Therefore it was decided to use colour differentiation. Further maximum and minimum HSL pixel colour values of a small test area of skin were manually calculated. These HSL ranges were then used to detect skin pixels in a subsequent frame (detection was indicated by a change of pixel colour to white). But Hue, when compared with saturation and luminosity, is surprisingly bad at skin differentiation (with the chosen background) and thus HSL shows no significant advantage over RGB. Moreover, since conversion of the colour data from RGB to HSL took considerable processor time it was decided to use RGB.[2]

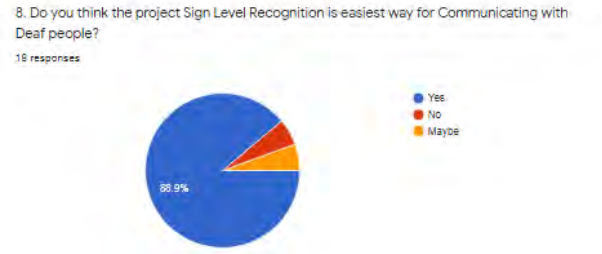
IV. SURVEY

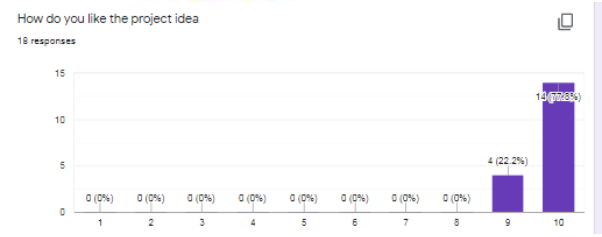












V. RESULT

The System which will be useful for people having speech impairment.The output of the sign language will not be only in text format but also in audio format. The project will also be implemented in application which will prove more useful. The System will recognize alphanumeric code and sign language gestures.

VI. CONCLUSION

Our project aims to bridge the gap by introducing an inexpensive computer in the communication path so that the sign language can be automatically captured, recognized and translated to speech for the benefit of blind people. In the other direction, speech must be analyzed and converted to either sign or textual display on the screen for the benefit of the hearing impaired. The sign language will be interpreted using the above techniques and then the result is fed to text to speech function which converts it to audio. In this system, we can see in text format and hear the sign language translation at the same time which makes it very convenient to use. The system will provide an interface that can easily communicate with people having speech impairment by Sign Language Recognition.

REFERENCES

[1] Hai, P. T., Thinh, H. C., Van Phuc, B., &Kha, H. H. (2018). Automatic feature extraction for Vietnamese sign language recognition using support vector machine. 2018 2nd International Conference on Recent Advances in Signal Processing, Telecommunications & Computing (SigTelCom).

[2] Purva C. Badhe, Vaishali Kulkarni, "Indian Sign Language Translator using Gesture Recognition Algorithm", 2015 IEEE International Conference on Computer Graphics, Graphics and Information Security (CGVIS).

[3] MdAzher Uddin, Shayhan Ameen Chowdhury, "Hand Sign language recognition for Bangla Alphabet using Support Vector Machines", 2016 International Conference on Innovations in Science Engineerig and Technology (ICISET).

[4] P.Gajalaxmi, T, SreeSharmila, "Sign Language Recognition for Invariant features based on multiclass Support Vector Machine with BeamECOC Optimization", IEEE International Conference on Power, Control, Signals and Instrumentation Engineering (ICPCSI-2017)

This page is kept blank intentionally

Comparison of Logistic Regression and Decision Tree method for Credit Card Fraud Detection

Tulika Kumar
Department of Electronics & Telecommunication
MPSTME NMIMS Pune, India
tulika.kumar21@nmims.edu.in

Anusha Lathi
Department of Electronics and Telecommunication
MPSTME NMIMS Bhilwara, India
anusha.lathi24@nmims.edu.in

Yukti Mathur
Department of Electronics andTelecommunication
MPSTME NMIMS Gotan, India
yukti.mathur25@nmims.edu.in

Prateeksha Shanoj
Assistant Professor EXTC Dept MPSTME, NMIMS Mumbai India
prateeksha.shanoj@nmims.edu

Abstract— **The use of Credit cards has drastically increased as they become one of the vital and most used modes of payment. Along with this the Credit Card. Fraud has also grown to a greater extent. Thus, it becomes vital for Credit card companies or banks to identify fraudulent transactions.**
Machine learning algorithms are used to analyze and identify suspicious transactions. Credit Card Fraud detection is a typical case of classification and data analysis, in this, we have focused on analyzing and comparing the data on parameters like accuracy, precision on the basis of two supervised learning classification algorithm Logistics Regression and Decision tree.

Keywords—Logistic Regression, Decision Tree, Credit card Fraud

I. INTRODUCTION

'Fraud' in credit card transactions is unauthorized and unwanted use of an account by someone other than the owner of that account. Required preventive steps can be taken to avoid this abuse and the behaviours of such fraudulent activities can be observed to mitigate it and protect against similar incidents in the future.

There are many types of frauds. Fraud occurs when a person forges a check or pays for something with a check knowing that there is not enough money, Internet sales are fraud in which fraudsters sell false goods or counterfeit products or take payment without delivering the product. There are a few more, such as fraud by charities, identity theft, credit card fraud, debt elimination, insurance fraud, Credit card fraud is one of the most prevalent frauds, due to the growing prevalence of cashless transactions.

Credit card fraud refers to the case where, when the issuer of the credit card is not aware of it, the fraudster uses the credit card for their needs. In 2018, fraudulent purchases carried out using credit cards obtained worldwide grew by 18.4 percent and are still growing.

There are two forms of fraud involving credit cards. One is physical card theft, and another is stealing confidential card details, such as card number, CVV code, card type, and others. A fraudster may broach a large amount of cash or make a large amount of payment by stealing credit card data before the cardholder finds out. Businesses use different machine learning techniques because these companies use various methods to identify fraudulent cases.

In this paper firstly, we analysed various credit card fraud detection techniques like Logistic Regression (LR), Random Forest (RF), Naïve Bayes (NB), Multilayer Perceptron (MLP), Decision Tree by reading different research paper and performing a rigorous literature survey. As a result of this, it was found that logistic regression and decision tree are most widely used because of various parameters which will be focused on further in this paper.

.

II. EXPERIMENTAL SETUP AND WORKS

LOGISTIC REGRESSION

Logistic Regression is a classification supervised technique which is used when the response variable is categorical. It is just like Linear Regression. It uses a logistic curve for fraud detection. It is used to predict the probability outcome either true or false, yes or no and one or zero i.e., it has two outcomes, here in case of credit card fraud detection it is fraudulent transaction or legitimate transaction.

$$y = e(bo+b1*x)/ (1 + e(b0+b1*x))$$

1. Dataset is imported with the additional libraries to the notebook for the in-depth analysis.
2. Data Cleaning is a process where inaccurate records or missing data is identified and then corrected, replaced with some relevant data or modified or deleted if irrelevant.
3. Preprocessing Data: If the data is accurate pre-processing data then the model is likely to give good

relevant results and when compared to with a model fo which data isn't well pre-processed.
It is further having four steps for preprocessing of data:
(i) Train test Split: Here the original dataset is divided into 2 parts i.e., train set and test set where both consist of data and labels.
(ii) Taking Care of Missing Values: If we have NaN values or garbage values, then the model will surely be garbage too. Therefore, considering missing values is important.
(iii) Takin Care of Categorical Features.
(iv) Normalization Data: it is better on a normalized data rather than a dataset not normalized.
The main of normalization is changing values to a common scale without distorting the difference between the range of values.
4. Data Modelling of Imbalanced data directly: Imbalanced data is a problem of classification observation per class is not uniformly distributed. Often, we have a majority class which has a larger number of data and other is few observations as a minority class.
5. Changing threshold: Default value for normalized predicted score is 0.5.
6. Creating over-sampling data and fitting the model: Oversampling incorporates choosing random models from the minority class with substitution training data with different duplicates and hence it is possible that a single instance may be selected multiple times.So, after oversampling , the model is fitted into the dataset.
7. Assigning weights to the model class: it is done to lower the rate class. If the class weight is set for the positive as the ratio of non-Fraud / Fraud, the result is approximately close to the over-sampling.
8. Final Result: We get different parameter's results.

DECISION TREE
Decision trees and their classes are popular algorithms for machine learning tasks of classification and regression. Decision trees are commonly used because they are simple to use, interpret, treat categorical characteristics, apply to the setting for multiclass classification, feature scaling is not necessary, and non-linearities and features can be captured easily.
Tree ensemble algorithms, such as random forests and boosting, for classification and regression tasks, are among the top performers. Because of these factors, decision trees often perform well on top of rules-based models in terms of facets and are often as a strong point of entry for fraud detection.
1. First of all, the data obtained is pre-processed before the modeling begins. Stratified sampling is then used to under sample normal records so that the models have the ability to learn the characteristics of both ordinary and fraud profile of the transaction.
2. To implement this, the variables that are the most important in discriminating fraudulent and legitimate transactions are detected.
3. These parameters are then used to shape stratified samples of the legitimate transactions.
4. Subsequently, these stratified samples of genuine transactions are combined with the fraudulent ones to form three samples with different fraudulent to normal record ratios. In fraud detection systems, the variables that shape the card user profile and the techniques used to create the model make the difference.
5. Our purpose in defining the variables used to form the data-mart is to differentiate the fraudulent card usage profile of the fraudsters from the card holders.

A. Comparative Study

A comparison of the usage pattern and transactions leads to classifying a transaction as fraud or legitimate in this paper [1]. The techniques used are KNN, Naïve Bayes, Logistic Regression, Chebyshev functional Link Artificial Neural Network (CFLANN), MultiLayer Perceptron and Decision Trees which are evaluated on basis of their result evaluated in terms of various accuracy metrics.It can be concluded in this paper that KNN is having highest accuracy ,KNN and Naive Bayes shows highest sensitivity and highest specificity.

This comparative study of some machine learning techniques in this paper[2] which gave the best results, according to state of art but applied to the same set of data. The objective of this study is to choose the best credit card fraud detection techniques to implement in our future work.
In this work[3], popular supervised and unsupervised machine learning algorithms have been applied to detect credit card frauds in a highly imbalanced dataset. It was found that unsupervised machine learning algorithms can handle the skewness and give best classification results. A number of popular algorithms in supervised, ensemble and unsupervised categories were evaluated on different metrics. It is concluded that unsupervised algorithms handle the dataset skewness in better ways and hence perform well over all metrics absolutely and relatively to other techniques.There were few NaNs values in the result table where the classifier couldnt detect even a single true positive or true negative value.Therefore, unsupervised, specifically IF and LOF are the overall winners for dealing with highly imbalanced datasets.
A quantitative understanding is done in this paper[4] based on its suitability to credit card fraud detection application. The investigations used datasets with "Time" and without"Time" attributes in addition to preparing the dataset suitable for feeding into the machine learning algorithms by using the method of under sampling.It can be concluded in this paper that Logistic Regression has a better precision and accuracy even with time and without time
In this paper [[5],by performing over sampling and extracting the principal direction of the data we can use KNN method to determine the anomaly of the target instance. Hence the KNN method can suit for detecting fraud with the limitation of memory. By the mean time outlier detection mechanism helps to detect the credit card fraud using less memory and computation requirements. Especially outlier detection works fast and well on online large datasets.
This paper [8]aims to conduct comparative analyses of identification of fraudulent activity on credit card utilizing support vector machine, k-nearest neighbour technique, naïve bayes and logistic regression techniques

using biased information, depending on the reliability to explore the most accurate method of classifying a credit card transaction as fraudulent or non-fraudulent by which some algorithm and combination of factors are considered. When tested under realistic conditions, Logistic Regression was the most accurate in detecting credit card fraud.With an accuracy of 99.074% and a precision of 93.61% thus makes it a suitable technique out of the four used from this paper.

Advantages and disadvantages of the techniques are stated as conclusion in this paper[9] ,from this we can understand that decision tree, rule based methods and CNN were easy to implement and require less training whereas artificial neural networks and HMM were Very slow to train. Require a lot of power. Hard to interpret. Decision tree though being easy to implement and widely used has a disadvantage of not being able to handle complex data. The objective of this paper was to give the advantage and disadvantages of all techniques mentioned but does not prove a clear conclusion about using which technique.

III. RESULTS

In this paper, two machine learning techniques were used to predict the fraudulent transactions. So, to evaluate both the methods, 70% of the dataset is used as a training set and the remaining 30% is used as a test dataset. Four parameters are calculated as follows: accuracy, precision, F1-sore and recall are used to test their evaluation of the performance. We can observe that the Decision Tree has a better accuracy than Logistic Regression. Precision of Decision Tree is much better than Logistic Regression. Similarly, F1 score and Recall of Decision tree is good when compared to Logistic Regression.

A. Comparison Table

TABLE I.: COMPARISON OF TECHNIQUES USED

Technique used	Parameters			
	Accuracy	Precision	F1-Score	Recall
Logistic Regression	0.99926	0.81720	0.78351	0.75248
Decision Tree	0.99947	0.88172	0.84536	0.81188

IV. CONCLUSION AND FUTURE SCOPE

Credit card fraud is a very serious concern around the globe.From the above comparative analysis of the two techniques, it is clear that Decision Tree performs the best. But the drawbacks of this paper by using the above techniques is that we cannot identify before the fraud happens, so this can be prevented. It tells us after fraud has happened. For further development of this project, we can work to solve this problem.

REFERENCES

[1] Samidha Khatri, Aishwarya Arora and Arun Prakash Agrawalr, ”Supervised Machine Learning Algorithms for Credit Card Fraud Detection: A Comparison” 2020 IEEE I10th International Conference on Cloud Computing, Data Science & Engineering (Confluence)

[2] S. Dhankhad, E. Mohammed and B. Far, ”Supervised Machine Learning Algorithms for Credit Card Fraudulent Transaction Detection: A Comparative Study,” 2018 IEEE International Conference on Information Reuse and Integration (IRI)

[3] Sangeeta Mittal and Shivani Tyagi, “ Performance Evaluation of Machine Learning Algorithms for Credit Card Fraud Detection” 2019 IEEE 9th International Conference on Cloud Computing, Data Science & Engineering (Confluence)

[4] S. Rajora et al., "A Comparative Study of Machine Learning Techniques for Credit Card Fraud Detection Based on Time Variance," 2018 IEEE Symposium Series on Computational Intelligence (SSCI)

[5] D. Dighe, S. Patil and S. Kokate, "Detection of Credit Card Fraud Transactions Using Machine Learning Algorithms and Neural Networks: A Comparative Study," 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA)

[6] I. SADGALI, N. SAEL and F. BENABBOU, "Fraud detection in credit card transaction using machine learning techniques," 2019 1st International Conference on Smart Systems and Data Science (ICSSD)

[7] Krishna Modi and Reshma Dayma "Review On Fraud Detection Methods in Credit Card Transactions " 2017 International Conference on Intelligent Computing and Control (I2C2'17)

[8] N.Malini and Dr.M.Pushpa "Analysis on Credit Card Fraud Identification Techniques based on KNN and Outlier Detection" 3rd International Conference on Advances in Electrical, Electronics, Information, Communication and Bio-Informatics (AEEEICB17)

[9] Ibtissam Benchaji and Samira Douzi "Using Genetic Algorithm to Improve Classification of Imbalanced Datasets for credit card fraud detection" 2018 Cyber Security in Networking Conference (CSNet-2018)

This page is kept blank intentionally

Assessment of Water Quality Index Using Fuzzy Logic

Dr.Sangeeta Mishra
Associate Professor
TCET,Mumbai
sangeeta.mishra@thakureducation.org

Nandita Mishra
SRM Institute Of Science& Technology
Chennai,India
nm4325@srmuniv.edu.in

Shashwat Shukla
SRM Institute Of Science& Technology
Chennai,India
ss7243@srmuniv.edu.in

***Abstract* - The aim of this study is to develop a framework to determine water quality index using fuzzy inference system. Water quality index (WQI) is basically a deterministic parameter based upon the concentration of several pollutants such as nitrate, pH, fluoride, total dissolved substance (TDS), total hardness (TH), biochemical oxygen demand (BOD), sulphate, manganese, Iron, temperature, etc. measured at the laboratory with a standard equipment under the guidelines of specific protocol. Samples collected from a study area of various districts of Karnataka. Several researches have been already carried out to estimate the water quality index using traditional statistical methods. However, water quality dataset at any specific location of our study area being a time series has got the missing information because the detection limit of the measurement techniques used. The presence of this missing information provides the knowledge of the concentration of pollutant is in the range, inviting the researcher to apply fuzzy set theory to estimate the WQI. With a motivation towards data science and application of fuzzy logic, here we have developed an inference engine to estimate the WQI. Our inference engine is based on Takagi-Sugeno implication. In order to reduce the rule structure, we have used hierarchical system. Results are well in agreement with the results that by traditional statistical technique.**

Keywords: ***Water quality index, Takagi-Sugeno model, Concentration, detection limit***

I. INTRODUCTION

Presently the protection of environmental and water quality management has become a significant issue in public policies all over the world. Availability of fresh and clean water for human utilization is one of the most important issues. Classification of water resources to satisfy water quality standards is an important issue in this respect. Human body is a water mechanism designed to run primarily on water and minerals. The movement of water within the cellular system also transports very important blood plasma, 92% of which is made up of water. It confirms the quality of water which is consumed will have severe impact on the overall condition of health. Human brain contains more than 80% water and controls each and every progression that happens within our body. Considering the very important role that water plays in our brain and nervous system is key to long life. The purity of water we drink causes impact on human strength and energy level. The quality of drinking-water is a powerful environmental determinant of health. Assurance of drinking-water safely is a foundation for the prevention and control of water borne disease. The biggest problem with water today is that the public does not really believe there is anything wrong with it. People think water problem begin when the water starts to develop bad smell, taste or look dirty, however, harmful pollutants and contaminants usually don't make water smell or taste bad. Today an estimated 50 to 70% of the populations, in rural areas are drawing water form "Poisoned lakes, streams and water tap ". Chemicals and Viruses are actually passed into households for everyday use and can cause cancer, Birth defects and genetic damage .According to the World Health Organization- "80% of all diseases are water borne". One can go without food for almost two months, but without water only a few days. So if people don't drink sufficient pure and clean water, they can damage every aspect of their physiology.

Introduction to Fuzzy logic The term fuzzy refers to things which are not clear or are vague. In the real world many times we encounter a situation when we can't determine whether the state is true or false, their fuzzy logic provides a very valuable flexibility for reasoning. In this way, we can consider the inaccuracies and uncertainties of any situation. In Boolean system truth value, 1.0 represents absolute truth value and 0.0 represents absolute false value. But in the fuzzy system, there is no logic for absolute truth and absolute false value. But in fuzzy logic, there is intermediate value too present which is partially true and partially false.

Fuzzy logic was introduced by Zadeh (1965).Great attention has been paid to the development of environmental indices based on fuzzy logic .The Fuzzy water quality index developed by Ocampo-Duque et al (2006) included 27 parameters. Fuzzy logic is a new approach to computing based on degrees of truth, differing from the true or false Boolean logic of the modern computer. Fuzzy logic includes 0 and 1 as extreme cases of truth but also includes the various states of truth in between Fuzzy logic appears similar to the reasoning of human mind. The fuzzy system is capable of

working with complex systems under uncertain and imprecise conditions.

Fuzzy logic is usually used for building fuzzy rules that can be easily understood by humans. Therefore, it is common to describe fuzzy variables as linguistic variables. The linguistics variables that we will use in this research are mild, moderate, severe and very severe for both the input and output parameters in the fuzzy model. By using those linguistic variable, fuzzy if-then rules which are the main output of the fuzzy system would be set up: generally presented in the form of: if x is A then y is B where x and y are linguistic variables and A and B are linguistic values, determined by their fuzzy sets. The first part of the rule is called the antecedent, and can consist of multiple parts with the operators AND or OR between them. The latter part is called the consequent, and can also include several outputs. Fuzzy logic is determined as a set of mathematical principles for knowledge representation based on degrees of membership rather than on crisp membership of classical binary logic. This powerful tool to tackle imprecision and uncertainty was initially introduced by to improved tractability, robustness and low-cost solutions for real world problems. Fuzzy sets have been applied in many fields in which uncertainty plays a key role [1]

BLOCK DIAGRAM OF FUZZY INFERENCE SYSTEM

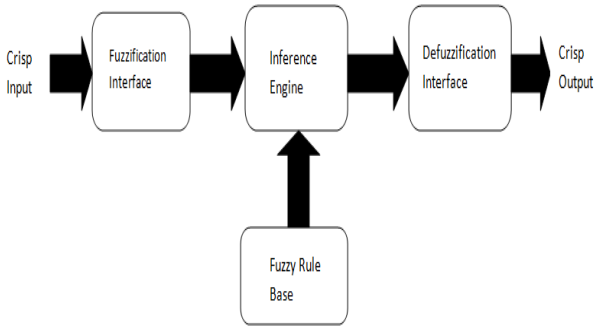


Fig : Block Diagram of FIS

Fuzzy Inference System Architecture:

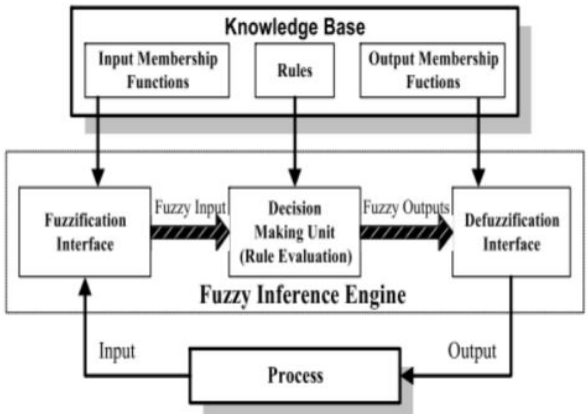


Fig 3.3.1: FIS Architecture

Defuzzification:

This is the process of calculating a scalar value from the fuzzy output. From composition we obtain a single fuzzy set. Defuzzification aggregates the set into a single value. The common techniques used are the centroid and maximum methods. In the centroid method, the scalar value of the output variable is computed by finding the variable value of the center of gravity of the membership function for the fuzzy value.

The general formula is

$$\bar{X}(centroid) = \frac{\int_b^a x\mu(x)dx}{\int_b^a \mu(x)dx}$$

Where [a, b] is the interval of the aggregated membership function. In the maximum method, the value at which the fuzzy subset has its maximum truth value is chosen as the value for the output variable.

II. IMPLEMENTATION

Selection of input Parameters:

We have collected the data of ground water from various districts of Karnataka namely Bijapur, Chikhallapur, Bangalore rural, Chamarajanagar and many others.

Selection of output Parameters:

The output parameter selected is water quality index(WQI)

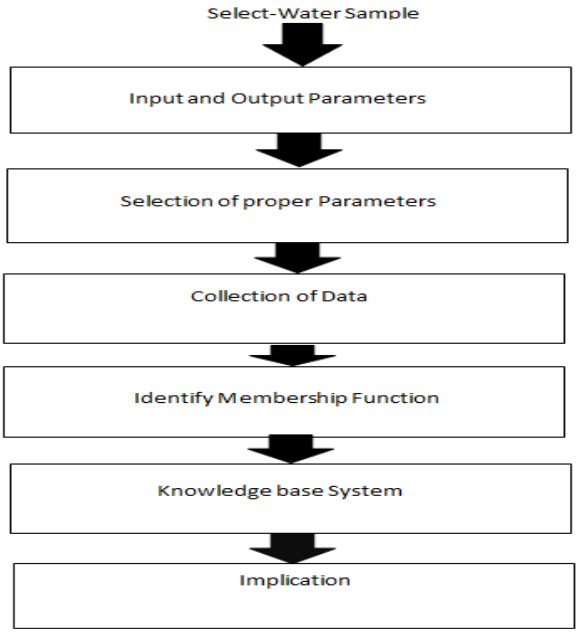
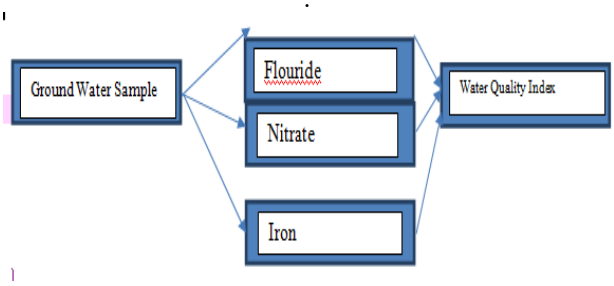


Fig : Flow Chart of Water Sample Analysis

Selection of proper parameters:

The different elements that are under our consideration are Iron, Fluoride, and Nitrate



Collection of Data:
We have studied the different datasheets of ground water over the years of each of these district and calculated the WQI of each of the collected sample based on different parameters i.e. the different elements present in it

Identify Membership functions:
Membership function for input is split into 3 ranges- Low, Moderate, High
Membership function for output is divided into 4 ranges- Very Poor, poor, Good, Very Good

Knowledge based system:
IF-THEN rules are used

Implication:
The percentage of the amount of each of the above mentioned elements present in the collected ground water samples were compared with the standard WHO values and based on that the quality of ground water suitable for drinking was evaluated
The practical implementation for the determination of WQI is done using Fuzzy Inference System (FIS)

Steps to calculate WQI:
a. Collect the amount of different components present in water (in mg/L) and find out its largest value
b.Split the range into 3 sections namely Low, moderate and high.Perform the same for each of the elements (3 elements)
c. Choose a common range for the output that is going to determine water quality for each of the district.
d.Split the range into 4 sections namely Very Poor, Poor, Good, and Very Good.
e. IF-THEN rules are set for each parameter
f. Rules are viewed in graphical manner
g.We can understand the effect of each parameter on Fuzzy Index based on maximum and minimum values taken for each parameter on their respective ranges.

2.Membership functions of Three Different Parameters

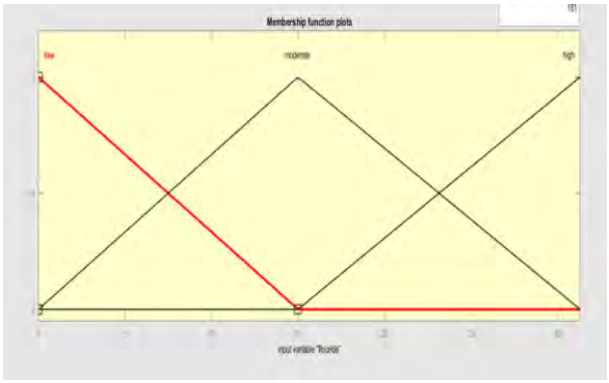


Fig 1 : Fluoride

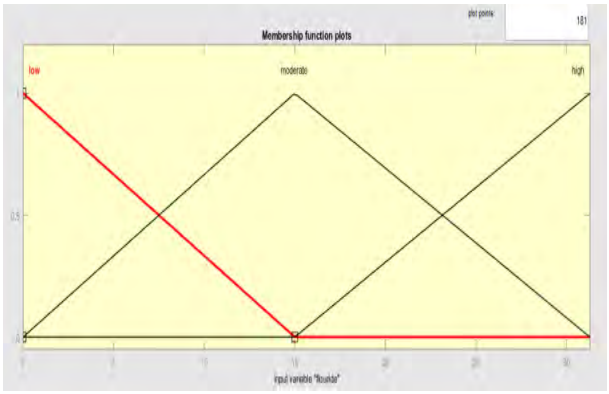


Fig 2 : Nitrate

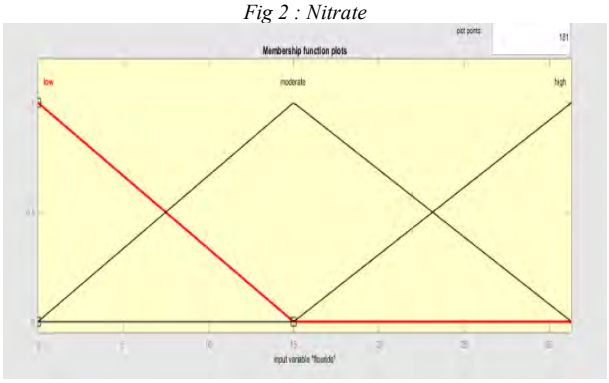


Fig 3 : Iron

MEMBERSHIP FUNCTION OF WATER QUALITY INDEX (WQI):

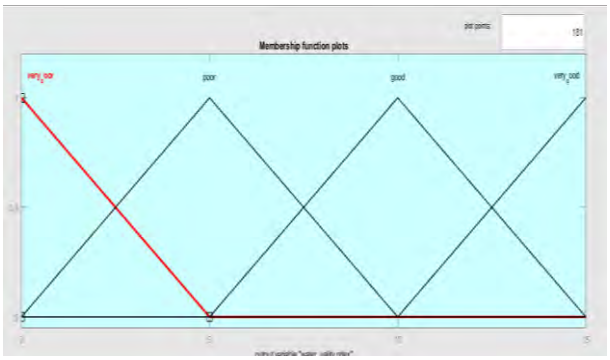


Fig 4: Water Quality Index(WQI)

ADD RULES:

Fig 5: IF-THEN Rules

IF-THEN Rules:

IF all parameters are set Low THEN WQI is Very Poor

IF all parameters are set High THEN WQI is Very Good

IF all parameters are set Moderate THEN WQI is Good

IF one of the parameters is set poor and other are set Moderate THEN WQI is good

IF one of the parameters is set Moderate and other are set poor THEN WQI is Very poor

IF one of the parameters is set High and other are set poor THEN WQI is poor

IF one of the parameters is set High and other are set Moderate THEN WQI is good

IF one of the parameters is set poor and other are set High THEN WQI is good

IF one of the parameters is set Moderate and other are set High THEN WQI is very good

Table 1:The table for W.H.O standard

Elements	W.H.O standard for water quality index(mg/L)
1. Iron	10-50
2. Fluoride	1-1.5
3. Sulphates	250
4. Nitrates	<45
5. TDS	<=300
6. Manganese	<0.05
7. PH	6.5-8.5

The above table defines the limits for standards of different elements suitable for drinking

III. DETERMINATION OF WQI:

If WQI lies

1. <=5 then the quality of water are Very Poor and is not suitable for drinking purpose

2. 5-10 then the quality of water is Poor and is still not suitable for drinking purpose

3. 10-15 the quality of water is good and is suitable for drinking only after treatment

4. 15 and above the quality of water is Very Good and is suitable for drinking purpose.

In the above output, the WQI lies in the range of 0-5 (i.e. 4.5), so we can conclude that the quality of water for Bijapur district is Very Poor and should not be consumed

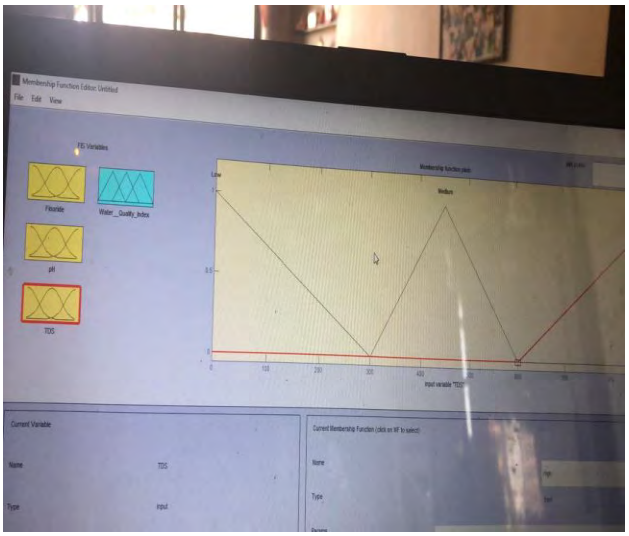
This is a very serious problem and immediate action should be taken.

Similar steps should be taken for the following districts.

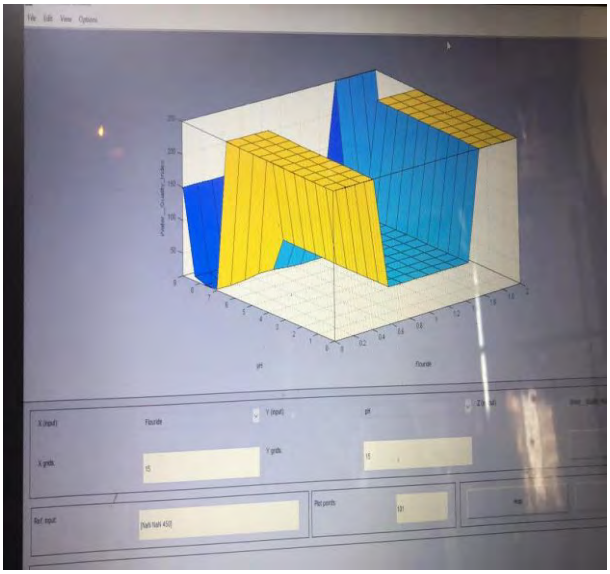
IV. RESULTS

The WQI was used to aggregate diverse parameters and their dimensions into a single score,. It was observed from the computed annual WQI that the values ranged from 53.18 during 2000 to 101.26 during 2009 and therefore can be categorized into “Good water” during 1978, 1979, 1980, 1999, 2000, 2008 to “Poor water” during 2009. However, it was generally observed that 14%, 80.50%, and 5.50% of all monthly computed WQI values from 1978 to 2009 have fallen under “Excellent”, “Good”, “Poor”, water quality respectively.

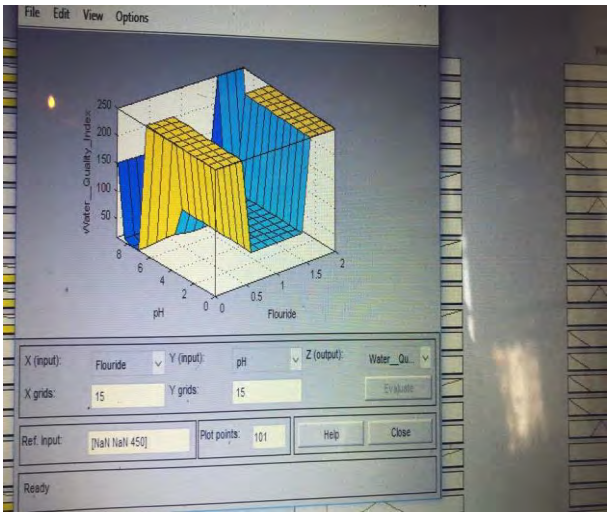
In addition, the use of fuzzy logic seems the clearest innovation in the last decade and it is appropriate for an accurate WQI. This approach allows to evaluate the impact of each variable in the final index of the quality of the water. However, it remains to establish weighting factors for specific water use. These weighting factors must be locally determined. There is a need of regular and detailed water quality monitoring of the Rivers which is presently carried out by the state pollution control board. There is a need to the identify changes or trends in water quality over time and space, to obtain necessary information to design specific pollution prevention programs and to determine whether goals such as compliance with pollution regulations or implementation of effective pollution control actions are being met.

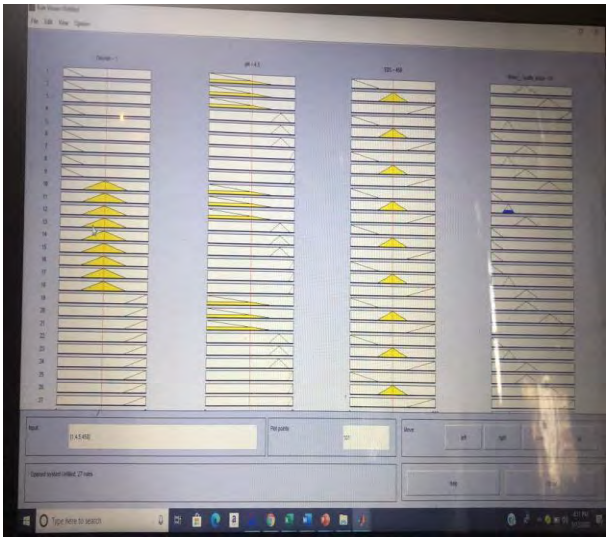


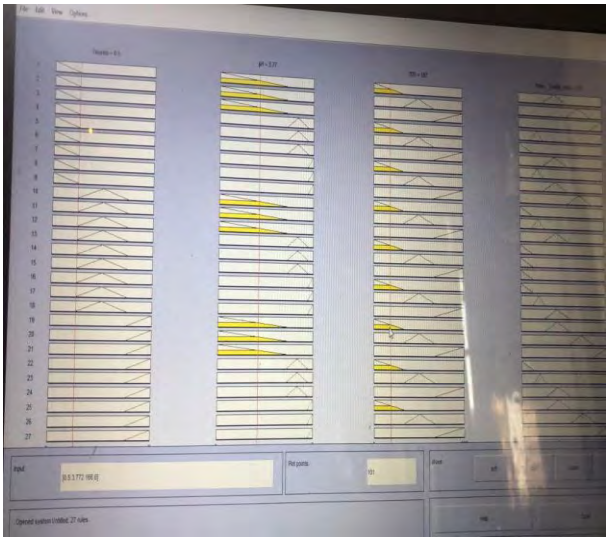
8. If (Flouride is Low) and (pH is High) and (TDS is Medium) then (Water_Quality_Index is Poor) (1)
9. If (Flouride is Low) and (pH is High) and (TDS is High) then (Water_Quality_Index is VeryPoor) (1)
10. If (Flouride is Medium) and (pH is Low) and (TDS is Low) then (Water_Quality_Index is Excellent) (1)
11. If (Flouride is Medium) and (pH is Low) and (TDS is Medium) then (Water_Quality_Index is Good) (1)
12. If (Flouride is Medium) and (pH is Low) and (TDS is High) then (Water_Quality_Index is Poor) (1)
13. If (Flouride is Medium) and (pH is Medium) and (TDS is Low) then (Water_Quality_Index is Excellent) (1)
14. If (Flouride is Medium) and (pH is Medium) and (TDS is Medium) then (Water_Quality_Index is Excellent) (1)
15. If (Flouride is Medium) and (pH is Medium) and (TDS is High) then (Water_Quality_Index is Excellent) (1)
16. If (Flouride is Medium) and (pH is High) and (TDS is Low) then (Water_Quality_Index is Excellent) (1)
17. If (Flouride is Medium) and (pH is High) and (TDS is Medium) then (Water_Quality_Index is Good) (1)
18. If (Flouride is Medium) and (pH is High) and (TDS is High) then (Water_Quality_Index is Poor) (1)
19. If (Flouride is High) and (pH is Low) and (TDS is Low) then (Water_Quality_Index is Poor) (1)
20. If (Flouride is High) and (pH is Low) and (TDS is Medium) then (Water_Quality_Index is VeryPoor) (1)
21. If (Flouride is High) and (pH is Low) and (TDS is High) then (Water_Quality_Index is Unsuitable) (1)
22. If (Flouride is High) and (pH is Medium) and (TDS is Low) then (Water_Quality_Index is Excellent) (1)
23. If (Flouride is High) and (pH is Medium) and (TDS is Medium) then (Water_Quality_Index is Good) (1)
24. If (Flouride is High) and (pH is Medium) and (TDS is High) then (Water_Quality_Index is Poor) (1)
25. If (Flouride is High) and (pH is High) and (TDS is Low) then (Water_Quality_Index is Poor) (1)
26. If (Flouride is High) and (pH is High) and (TDS is Medium) then (Water_Quality_Index is VeryPoor) (1)
27. If (Flouride is High) and (pH is High) and (TDS is High) then (Water_Quality_Index is Unsuitable) (1)
If
and

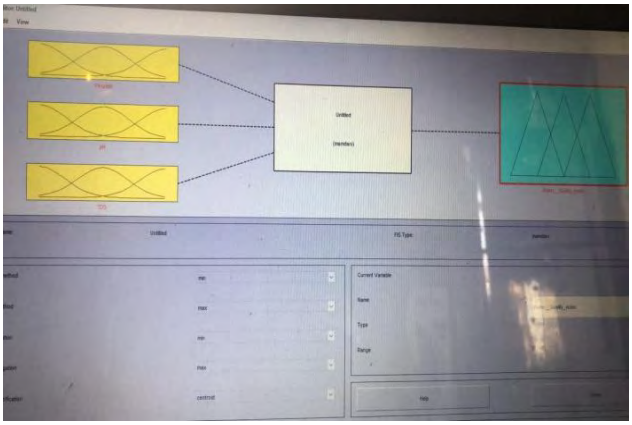


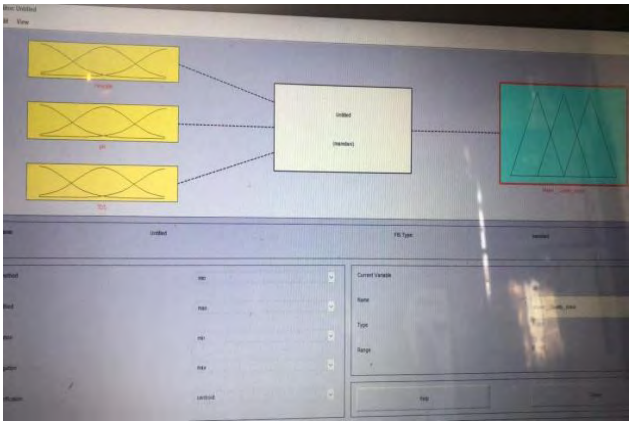
1. If (Flouride is Low) and (pH is Low) and (TDS is Low) then (Water_Quality_Index is Poor) (1)
2. If (Flouride is Low) and (pH is Low) and (TDS is Medium) then (Water_Quality_Index is VeryPoor) (1)
3. If (Flouride is Low) and (pH is Low) and (TDS is High) then (Water_Quality_Index is Unsuitable) (1)
4. If (Flouride is Low) and (pH is Medium) and (TDS is Low) then (Water_Quality_Index is Good) (1)
5. If (Flouride is Low) and (pH is Medium) and (TDS is Medium) then (Water_Quality_Index is Excellent) (1)
6. If (Flouride is Low) and (pH is Medium) and (TDS is High) then (Water_Quality_Index is Poor) (1)
7. If (Flouride is Low) and (pH is High) and (TDS is Low) then (Water_Quality_Index is Good) (1)
8. If (Flouride is Low) and (pH is High) and (TDS is Medium) then (Water_Quality_Index is Poor) (1)
9. If (Flouride is Low) and (pH is High) and (TDS is High) then (Water_Quality_Index is VeryPoor) (1)
10. If (Flouride is Medium) and (pH is Low) and (TDS is Low) then (Water_Quality_Index is Excellent) (1)
11. If (Flouride is Medium) and (pH is Low) and (TDS is Medium) then (Water_Quality_Index is Good) (1)
12. If (Flouride is Medium) and (pH is Low) and (TDS is High) then (Water_Quality_Index is Poor) (1)
13. If (Flouride is Medium) and (pH is Medium) and (TDS is Low) then (Water_Quality_Index is Excellent) (1)
14. If (Flouride is Medium) and (pH is Medium) and (TDS is Medium) then (Water_Quality_Index is Excellent)
15. If (Flouride is Medium) and (pH is Medium) and (TDS is High) then (Water_Quality_Index is Excellent) (1)
16. If (Flouride is Medium) and (pH is High) and (TDS is Low) then (Water_Quality_Index is Excellent) (1)
17. If (Flouride is Medium) and (pH is High) and (TDS is Medium) then (Water_Quality_Index is Good) (1)
18. If (Flouride is Medium) and (pH is High) and (TDS is High) then (Water_Quality_Index is Poor) (1)
19. If (Flouride is High) and (pH is Low) and (TDS is Low) then (Water_Quality_Index is Poor) (1)
20. If (Flouride is High) and (pH is Low) and (TDS is Medium) then (Water_Quality_Index is VeryPoor) (1)


File Edit View Options
Water_Quality_Index
pH
Flouride
X (input): Flouride
Y (input): pH
Z (output): Water_Qu...
X grids: 15
Y grids: 15
Evaluate
Ref. input: [NaN NaN 450]
Plot points: 101
Help
Close
Ready









REFERENCES

[1] R. Jain, 1976. “Decision making in the presence of fuzzy variables,” IEEE Transactions on Systems, Man and Cybernetics, vol. 6, no. 10, pp. 698–703.

[2] L. A. Zadeh, 1965. “Fuzzy sets,” Information and Control, vol. 8, no. 3, pp. 338–353.

[3] W.H.O., 1992 International standards for drinking water. Geneva: World Health Organization

[4] Siler, W; Buckley, J. J., Fuzzy expert systems and fuzzy reasoning, John Wiley & Sons, Inc., ISBN 0-471-38859-9, 2005.

[5] Fuzzy Logic - From Concept to Implementation", (Application Note EDU01V10-0193. ((c) 1993 by Aptronix, Inc, (408) 428-1888).

[6] Johnson, V., Apalachicola Bay: Endangered Estuary, Florida Water, 2, 1993

[7] R.M. Bhardwaj etc.; Status of Water Quality in Yamuna River, Seminar on Water for National Capital Territory, Delhi, April, 30,2003,Indian Association of Hydrologists, Delhi Regional Centre,pp.59-68CWC one day

[8] Rao, K.L, (1979),India’s Water Wealth Its Assessment, Uses and Projections, Orient Longman, New Delhi, pp.39-70

[9] Jui-Sheng Chou, Chia-Chun Ho, Ha-Son Hoang, 2017. Determining quality of water in reservoir using machine learning.

[10] Howladar, M. F., Numanbakth, M. A. A. & Faruque, M. O. An application of Water Quality Index (WQI) and multivariate statistics to evaluate the water quality around Maddhapara Granite Mining Industrial Area,Dinajpur,Bangladesh. EnvironmentaSystems Research 6(1), 13 (2018).

[11] Yafra Khan, Chai Soo See, 2016. Predicting and Analyzing Water Quality using Machine Learning: A Comprehensive Model.

[12] Ramakrishna, C.R., Sadashivaiah, C. and Ranganna, G., 2009. Assessment of water quality index for the groundwater in Tumkur Taluk, Karnataka State, India .E. J. Chem., 6(2):523-30.

[13] Arkadi Parparov, K David Hambright, Tom Berman, 2014, Water Quality Assessment, Lake Kinneret pp 607-615.

Human Emotional Recognition Using Temporal Features by Multiclass support vector machine classifier

T. R. Ganesh Babu
Department of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram
India
ganeshbabutr@gmail.com

U. Saravanakumar
Department of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram
India
saran.usk@gmail.com

B.Gopi
Department of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram
India
dean.ece@mec.edu.in

S. Selvarasu
Department of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram
India
selvarasu.s.ece@mec.edu.in

M.Mohanavarthini
Department of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram
India
mohanavarthini620@gmail.com

R.Monisha
Department of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram
India
monisharazz2199@gmail.com

Abstract— **The method of detection of human emotions is emotional awareness. The ability of people to identify the feelings of others varies greatly. A relatively new field of study is the use of technology to support emotionally recognized people. Multiclass Support Vector Machine (m-SVM) based human emotional recognition using temporal features is presented in this study. The temporal features are used for feature extraction. Then the classification is made by using m-SVM. The emotional signals like angry, sad, happy and surprise are used for this study. Experimental results show the performance of proposed system.**

Keywords— Emotional speech recognition, Temporal features, Multiclass support vector machine

I. INTRODUCTION

Current methods are not popular in unseen images or images captured by the wild. This paper attempts to construct an artificially smart emotionally identifiable device with the facial expressions of unknown individuals [1]. The network of three convolutional layers each in this paper consists of a maximum pooling and rectified linear structure. Affective computing, due to its extensive use of the human computer interface, has become a increasing area of research activities. Recognition of emotions is one of the cutting-edge methods used to describe the psychological state of the individual [2]. Human emotions overlap very much in nature and thus involve an efficient assembly of the extractor and classifier.

The model outcome is one of the emotional categories selected. The purpose of the model is to resolve the disparity between human interpretation and understanding of the system. To that end, we are using the fluctuating c-means in which a given data is partitioned into homogenous clusters to interpret the emotion of a face image. The homogenous that every point in the same cluster share similar attributes [3]. A robust emotion monitoring program to quantify and document human emotional changes in realistic uses is developed to provide the implementation of technical advancement for human signals [4] understanding emotional variances and physics.

A multivariate, analytical decomposition process based feature extraction approach is proposed in order to define emotional state as high / low anticipation and high / low valence. The findings are expected to classify emotions inducted by viewing music videos. Multi-channel signals are divided into intrinsic mode functions, data bearings are chosen to extract power, volatility index, hjorth and asymmetric left and right hemispheres [5]. As well as the gestures of the human face, voice was seen as one of the most important ways of identifying human emotions automatically. Speech is a spontaneous, thoroughly sensing medium of emotions [6]. The cepstral coefficients for mel-frequency extraction and the multiple vector support method for classification.

Traditionally, systems for the identification of facial emotions are tested using laboratory-controlled data that is not environmentally reflective in real world applications. This paper suggests a method called extremely sparse learning, which has the potential to learn a dictionary and a non-linear model of classification jointly, in order to strongly identify facial expressions in real world natural situations [7]. The proposed method combines the selective power of the extreme research machine with the rebuilding function of sparse representation, so that the noisy signals and incomplete data captured in natural contexts can be accurately categorized.

This is the acoustic aspect of the speech signal. The extraction of function is the method that extracts a little

data from the voice signal, which can be used for each speaker afterwards. Many extraction methods are available and the cepstral coefficient of Mel frequency is the common method [8]. The first step to identify a person with different facial muscle movements under the eyes, nose and lips, should be identified and categorized by comparing these characteristics with qualified data values using a good classification to detect the emotion [9-10].

Multiclass support vector machine based human emotional recognition using temporal features is discussed. The paper is organised as follows: Section 2 describes the methods and materials of lung image classification. The section 3 describes about experimental results and discussion. The last section concludes lung cancer classification.

II. METHODS AND MATERIAL

At first the input speech signals are given to temporal features for feature extraction. Then the features are stored in database. Finally, classification is made by using m-SVM.

a) Temporal Feature Extraction

Time characteristics, easy to detect and easy to perceive physical, such as: signal power, zero transmission rate, maximum amplitude, minimum power, etc. There is no data on frequency or series in the temporal domains. There was a mistake. Only the distances between events in relation to the distances between other events are the information carried in the temporal domain. Time characteristics (time domain) are simple to derive and easy to interpret, for example: signal strength, zero intensity, maximum amplitude, minimum power and so on.

In time behavior, for example to discern music from speech in an audio signal or to distinguish walking motion by means of an accelerometer. Temporary features allow recognition of these models to be formulated in a handful of dimensions within the standard structure of the points clusters. Several applications for audio signals were added. Some of the innovations behind them can be quickly moved to other areas.

b) m-SVM classification

The m-SVM is intended by use of support-vector machines to assign labels to instances, where they are drawn from a finite set of many elements. The key solution is that the single multi-class problem can be reduced to several problems with binary classification. Building binary classifiers, which can differentiate between one mark and the rest or between each class pair (one versus one), are typical methods for such a reduction. A winner-take-all strategy is used to classify new instances in the single versus all case, in which a classifier with the top output function assigns the class. Figure 1 shows the workflow of m-SVM.

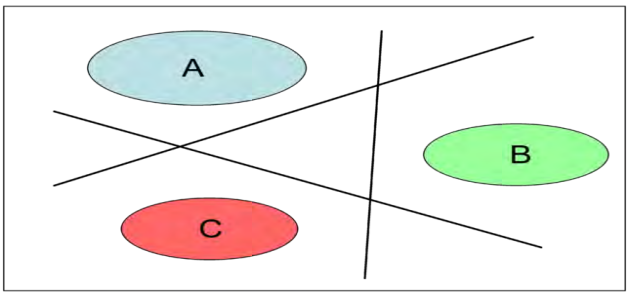


Fig.1. m-SVM classification

III. RESULTS & DISCUSSION

The performance of the proposed system is made by using emotional speech database. The database consists of four emotions angry, happy, sad and surprise. Initially the emotional speech signals are given to temporal features for feature extraction. Then the m-SVM is used for categorization. The performance is measured in terms of accuracy sensitivity and specificity using temporal and m-SVM classifier is shown in table 1.

Table 1: Performance Analysis of m-SVM classification

Temporal features	Performance of m-SVM (%)			
	Angry	Happy	Sad	Surprise
1	85	87	88	86
2	87	89	90	89
3	91	93	92	90
4	90	91	90	88

From the above table it is observed that the highest classification accuracy of angry, happy, sad and surprise are 91%, 93%, 92% and 90% at the 3rd level of temporal features and m-SVM.

IV. CONCLUSION

A Multiclass support vector machine based human emotional recognition using temporal features is presented. Initially, the angry, happy, sad and surprise speech signals are given to temporal features for feature extraction. Then the features are stored in database. Finally, classification is made by using m-SVM. The

highest classification accuracy is obtained at the 3rd level features in happy class. The minimum classification accuracy is obtained by using surprise class 90% by using temporal features and m-SVM.

REFERENCES

[1] Salunke, V. V., & Patil, C. G. (2017, August). A New Approach for Automatic Face Emotion Recognition and Classification Based on Deep Networks. In 2017 International Conference on Computing, Communication, Control and Automation (ICCUBEA) (pp. 1-5). IEEE.

[2] Basu, A., Routray, A., Shit, S., & Deb, A. K. (2015, December). Human emotion recognition from facial thermal image based on fused statistical feature and multi-class SVM. In 2015 Annual IEEE India Conference (INDICON) (pp. 1-5). IEEE.

[3] Jamshidnejad, A., & Jamshidined, A. (2009, July). Facial emotion recognition for human computer interaction using a fuzzy model in the e-business. In 2009 Innovative Technologies in Intelligent Systems and Industrial Applications (pp. 202-204). IEEE.

[4] Wang, H. P., & Chen, C. M. (2010, May). Assessing the effects of various multimedia curriculums to learning emotion and performance based on emotion recognition technology. In 2010 International Symposium on Computer, Communication, Control and Automation (3CA) (Vol. 2, pp. 365-368). IEEE.

[5] He, Y., Ai, Q., & Chen, K. (2017, August). A MEMD Method of Human Emotion Recognition Based on Valence-Arousal Model. In 2017 9th International Conference on Intelligent Human-Machine Systems and Cybernetics (IHMSC) (Vol. 2, pp. 399-402). IEEE.

[6] Sonawane, A., Inamdar, M. U., & Bhangale, K. B. (2017, August). Sound based human emotion recognition using MFCC & multiple SVM. In 2017 International Conference on Information, Communication, Instrumentation and Control (ICICIC) (pp. 1-4). IEEE.

[7] Shojaeilangari, S., Yau, W. Y., Nandakumar, K., Li, J., & Teoh, E. K. (2015). Robust representation and recognition of facial emotions using extreme sparse learning. IEEE Transactions on Image Processing, 24(7), 2140-2152.

[8] Likitha, M. S., Gupta, S. R. R., Hasitha, K., & Raju, A. U. (2017, March). Speech based human emotion recognition using MFCC. In 2017 international conference on wireless communications, signal processing and networking (WiSPNET) (pp. 2257-2260). IEEE.

[9] Manahoran, N., & Srinath, M. V. (2017). K-Means Clustering Based Marine Image Segmentation. International Journal of MC Square Scientific Research, 9(3), 26-29.

[10] Kumarapandian, S. (2018). Melanoma Classification Using Multiwavelet Transform and Support Vector Machine. International Journal of MC Square Scientific Research, 10(3), 01-07.

This page is kept blank intentionally

Brain Structure Analysis Based on Naïve Bayes and Random Forest Approach

T. R. Ganesh Babu
Dept.of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram, India
ganeshbabutr@gmail.com

U. Saravanakumar
Dept.of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram, India
saran.usk@gmail.com

J. Rangarajan
Dept.of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram, India
rangarajan.j.ece@mec.edu.in

R. Praveena
Dept.of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram, India
praveena.r.ece@mec.edu.in

V. Tharani
Dept.of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram, India
tharaniroshan98@gmail.com

S. Vaishnavi
Dept.of ECE
Muthayammal Engineering College
Kakkaveri, Rasipuram, India
vaishusenthil20@gmail.com

***Abstract*— A brain tumour is an irregular brain cell collection or mass. Your skull is very rigid that surrounds your brain. Growth can cause problems within such a restricted environment. The brain structure analysis based on machine learning approach is presented. Initially, the brain images are given to Stationary Wavelet Transform (SWT) for decomposition and it produces sub-band coefficients. Then these sub-band coefficients are used for classification using random forest and naïve bayes classifier. The result section discusses about the performance evaluation of proposed mammogram classification system.**

Keywords*— Brain tumor analysis, Stationary wavelet transform, Sub-band coefficients, Naïve bayes, Random forest

I. INTRODUCTION

A tool for classifying a typical or abnormal representation of the MR brain based on a Neural Network (NN). This technique first uses a transforming wavelet to remove image features, followed by the review of the main factor approach to reduce the object dimensions [1]. The reduced features are transmitted to a back NN, which is used for the optimum determination of the NN in normalized conjugate gradient.

First, the approach used a discrete wavelet to extract image features and then the principle component analysis technique was employed to reduce the feature size. The decreased features have been transmitted to a feed-forward network that optimizes the parameters through an improves fitness and chaotic theory [2]. The improved algorithm was referred to as the scaled chaotic bee colony. In order to prevent over fitting the K-fold stratified cross validation was also used.

A better version of orthogonal discrete wavelet transformation (DWT), called slantlet transform, can be used particularly to boost position of time with short filter supports simultaneously. We determined its histogram for every two-dimensional MR image, and on this histogram signal, Slantlet transformation was applied [3]. Then, Slantlet magnitudes convert outputs equal to six space positions, selected by a particular logical process, for each image is generated by considering a feature vector [4]. The derived features are used to train a binary classifier based on a neural network.

The approach used to derive functions from MR brain images by stationary wavelet transformation (SWT). Last, the main study of the components was used to decrease SWT coefficients [5]. Finally, we suggested the use of 2 classifiers, namely the generalized GEPSVM and the radial basis function kernel GEPSVM.

In the first step, we must receive and transform the MR image to data in the second phase with a reduction of dimensions using the theory analysis of component sections, the back-neural network then is used as a method to identify subjects as normal or abnormal images of the brain [6]. In the preprocessing stage, the given images are de-noised by means of a median filter. The noisy images are then shown as transformations inputs to the wavelet. The transforming wavelet is used for extracting apps. The majority of techniques of transformation yield coefficient values of the same size as the original image [7]. Predefined wavelet families such as Daubechies (db8), Biorthogonal (bio3.7) and Symlets (sym8) are used.

This study discusses analysis of the structure of the brain based on the method of machine learning. In Section 2 we define the materials and methods. The remainder is arranged as follows. Section 3 describes the experimental results and debate. The last segment ends with the program suggested.

II. METHODS AND MATERIALS

Firstly, SWT is given the brain input images for decomposition and produces the coefficients on the sub-band. Then the classification of brain images is used for the random forest and naive bayes. Fig. 1 shows the workflow of proposed brain analysis system.

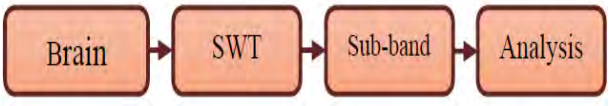


Fig. 1. *Brain image classification - workflow*

III. STATIONARY WAVELET TRANSFORM

SWT is a wavelet algorithm that transforms the discrete wavelet and prevents the loss of its translation. Invariance is reached by the removal of down samplers and upsamplers in the DWT and an algorithm factor in the filter coefficients.

The SWT is a redundant system intrinsically since the output at each SWT level is as high as the input, and thus N in the coefficients for N level decomposition occurs. SWT is a redundant system. The some of the applications of SWT are, pattern recognition and signal denoising.

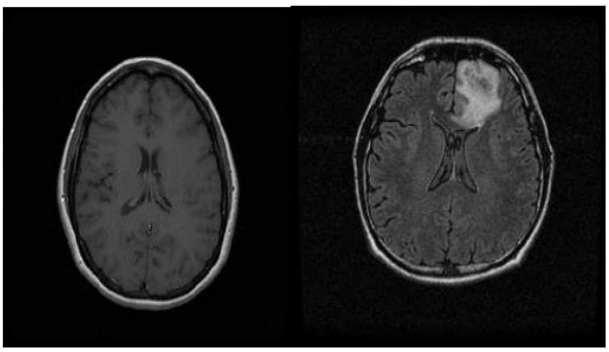
IV. CLASSIFICATION USING MACHINE LEARNING CLASSIFIER

Naïve Bayes is a collection of simple and reliable classifiers based on the Baye theorem, which assumes strongly independence among the characteristics.. The simplest network models in Bayesian. Nevertheless, they can be combined with kernel density measurements and obtained more precision. Naïve Bayes classification systems are incredibly scalable, allowing for a variety of parameters that are constant in the number of learning variables [8-9].

Random forests or random decision-making forests are an ensemble training method for classification, regression and other activities, which operate by setting up a number and generating class or mean prediction for individual trees in many decision-making entities during training. Random forests correctly dominate decision makers in their training pattern.

V. RESULTS AND DISCUSSION

The performance of brain tumour analysis is measured in terms of accuracy. The mammogram images are used for performance. The sample mammogram images are shown in figure 2.



(a) Normal (b) Abnormal

Fig. 2. Sample brain images in database

First, SWT is given input brain images to decompose and to generate sub-band coefficients. Finally, classification classifications such as naive bays and random woods are used. Table 1 shows the performance of proposed system using brain images.

From Table I, the maximum accuracy of classification obtained in the SWT decomposition and hybrid classifier 3rd stage of 96% has been observed. Its sensitivity and specificity using SWT functions are 97% and 95%. Fig. 2 shows the graphical representation of proposed brain tumor analysis.

TABLE I. PERFORMANCE OF BRAIN IMAGE CLASSIFICATION USING SWT

SWT LEVELS	PERFORMANCE OF HYBRID CLASSIFIERS (NAÏVE BAYES AND RANDOM FOREST)(%)		
	ACCURACY	SENSITIVITY	SPECIFICITY
1	89	90	91
2	91	92	93
3	96	97	95
4	94	95	93

From the above table, The maximum accuracy of classification obtained in the SWT decomposition and hybrid classifier 3rd stage of 96% has been observed. Its sensitivity and specificity using SWT functions are 97% and 95%. Figure 2 shows the graphical representation of proposed brain tumor analysis.

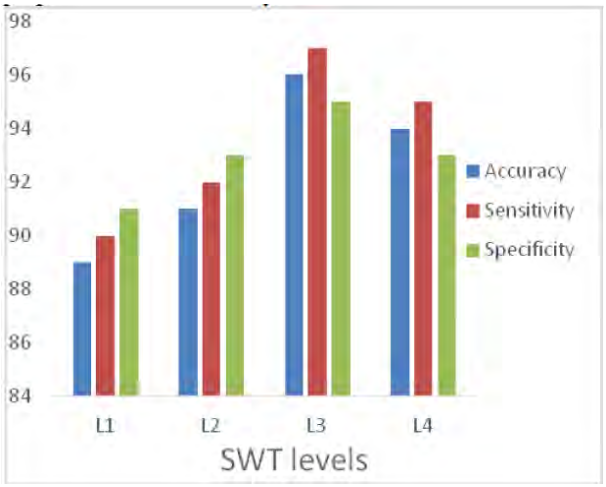


Fig. 3 Graphical representation of proposed brain tumor analysis

VI. CONCLUSION

Brain structure analysis based on machine learning approach is presented in this study. At first, the normal and abnormal brain images are given to SWT for decomposition at 4 levels. Then the naïve bayes and random forest classifier is used for classification. The maximum classifier accuracy is 96% obtained at the 4th decomposition level and hybrid classifiers like naïve bayes and random forest. The minimum classification accuracy is 89% obtained at the 1st level of SWT decomposition and hybrid classifiers.

REFERENCES

[1] Zhang, Y., Dong, Z., Wu, L., & Wang, S. (2011). A hybrid method for MRI brain image classification. Expert Systems with Applications, 38(8), 10049-10053.

[2] Zhang, Y. D., Wu, L., & Wang, S. (2011). Magnetic resonance brain image classification by an improved artificial bee colony algorithm. Progress In Electromagnetics Research, 116, 65-79

[3] Zhang, Y. D., Wang, S., & Wu, L. (2010). A novel method for magnetic resonance brain image classification based on adaptive chaotic PSO. Progress In Electromagnetics Research, 109, 325-343.

[4] Maitra, M., & Chatterjee, A. (2006). A Slantlet transform based intelligent system for magnetic resonance brain image classification. Biomedical Signal Processing and Control, 1(4), 299-306.

[5] Zhang, Y., Dong, Z., Liu, A., Wang, S., Ji, G., Zhang, Z., & Yang, J. (2015). Magnetic resonance brain image classification via stationary wavelet transform and generalized eigenvalue proximal support vector machine. Journal of Medical Imaging and Health Informatics, 5(7), 1395-1403.

[6] Ibrahim, W. H., Osman, A. A. A., & Mohamed, Y. I. (2013,August). MRI brain image classification using neural networks. In 2013 international conference on computing,

[7] electrical and electronic engineering (ICCEEE) (pp. 253-258). IEEE.

[8] Mohankumar, S. (2016). Analysis of different wavelets for brain image classification using support vector machine. International Journal of Advances in Signal and Image Sciences, 2(1), 1-4.

[9] Ranganathan, S. (2019). Rain Removal in the Images Using Bilateral Filter. International Journal of MC Square Scientific Research, 11(1), 9-14.

[10] Manahoran, N., & Srinath, M. V. (2017). K-Means Clustering Based Marine Image Segmentation. International Journal of MC Square Scientific Research, 9(3), 26-29.

This page is kept blank intentionally

Analysis of Satellite Images for Detection of Depletion of Water Resources

Akshata Ramane
dept. of Electronics and Telecommunicaton Engineering
Thakur College of Engineering and Technology
Mumbai, India
akshataramane2099@gmail.com

Niketan Rai
dept. of Electronics and Telecommunicaton Engineering
Thakur College of Engineering and Technology
Mumbai, India
niketan.rai@hotmail.com

Priyanka Mishra
dept. of Electronics and Telecommunicaton Engineering
Thakur College of Engineering and Technology
Mumbai, India
priyankamishra102000@gmail.com

***Abstract*—Remote sensing (RS) using satellites images became a prevalent modern technology which is being used in numerous applications. Remote sensing is getting the data and information about any phenomenon or object without making physical contact with it. It is used in various fields including, land surveying, various Earth Science disciplines such as ecology, hydrology, etc. and in geography. One of the interesting areas of research is the use of Remote Sensing in water detection and analysis. In this paper, we will review the research that makes use of water detection techniques using the satellite images. We will review various technique and compare them to check their results against each other. It will help to come up with the best technique that can be used for our research.**

I. INTRODUCTION

Water resources in our lives affect Environmental, Agricultural, and Industrial aspects, which is why studying them and trying our best to conserve them is required. Surveying of water bodies and its features properly is very first step for any planning, especially for places like India, where the land-cover is dominated by water bodies. Developing countries like India will be benefitted if water transport is encouraged. In water transport, the link should be made between various land masses, including building blocks, through proper navigational system.

Identification and monitoring of different water surfaces have been a tough experiment for quite a while in remote sensing information processing. An extensive number of studies are accessible in the important literature dealing in water and wetness location and checking for land administration and protection.

Assessment of present as well future water resources, river dynamics, agriculture suitability, river dynamics, wetland inventory, climate models, watershed analysis environment monitoring, surface water survey-management and flood mapping are some major areas that need information about the water. A thorough analysis of satellite images can play a significant role in discriminating and differentiating the changes in the earth areas between different changes of imaging. Satellite image processing plays important role for research and development in astronomy, remote sensing, agriculture monitoring and disaster management and other fields. Satellite images are recorded in digital forms and then processed to extract information. This image can be obtained by remote sensing. Remote sensing is the art and science of obtaining information about an object, area, or phenomenon through the analysis of data acquired by a device that is not in contact with the object, area, or phenomenon under investigation.[1]

II. AIM & OBJECTIVE

The task of this activity is to identify the changes in surface water by using QGIS for spectrum analysis.

The observation of surface water from space is of importance for mitigating the impacts of hydrological extremes because of the role of surface water bodies and rivers in providing storage during periods of drought, and as the conveyance of flood waters. This applies to man-made reservoirs also, which can serve multiple purposes such as water storage and flood control. Flooding also manifests as temporary surface water that can be observed from space. In all cases, the goal is to measure the height and extent of the surface water and potentially derive the volume based on local bathymetric measurements [3].

III. LITERATURE SURVEY

Rokni, K. et al. (2015) gave a new approach for surface water change detection. They introduced a new approach based on Integration of image fusion and image classification techniques for surface water change detection. The result shows the high performance by using the Gram Schmidt ANN and Gram Schmidt SVM approaches which provide a remarkably high accuracy results; this approach has the advantage of producing a high-resolution multispectral image. In the end, the suggested approach has been proven to be effective3 in detecting the water surface changes of Lake Urmia, Iran.

Gierach, M. M., et al. (2016) detected wastewater diversion plumes in Southern California. They examined the capabilities of multi-sensor satellite data to detect the 2006 HTP and 2012 OCSD wastewater diversions and their impact on water quality in the SCB. Data included ocean colour from MODIS-Aqua and SST from ASTER- Terra. The result from this was applied to the recent HTP diversion, which occurred from 21 September to November 2015 in response to the observation made during 2006 HTP diversion inspection.

Arvinda, C. S., et al. (2016) used MODIS images to analyze the flood affected areas. Mean shift and SOM techniques were utilized for the flood assessment. The SOM algorithm was used before, during as well as after accessing the flood affected area images. The flooded and non-flooded regions were differentiated through the ROC performance evaluation parameters. At last, the result of the study shows that proposed method is effective enough to provide a clear view of the flood affected areas.[4]

IV. METHODOLOGY

Get the data: Getting the image from the ISRO website. Here we are able to get the image of any location as these images are taken by satellites of ISRO

Extract information: In this basic analysis of the image can be done.

Image preprocessing: Using QGIS image preprocessing. QGIS functions as geographic information system (GIS) software, allowing users to analyze and edit spatial information, in addition to composing and exporting graphical maps. QGIS supports both raster and vector layers; vector data is stored as either point, line, or polygon features.

Image Interpretation: Analysis of remote sensing images involves the identification of various targets i.e. features. Targets maybe defined in the terms of the way they reflect or emit radiation. This radiation is measured and recorded by the remote sensors. This process involves detection, recognition, analysis, deduction, and classification.

Spectral signature: Identity is whatever makes an entity recognizable. Signature is that which gives an object or piece of information about object. Spectral signatures of water are reflection of light wavelength, water depth whether it is shallow or deep, suspended material, chlorophyll content, surface roughness etc.

This is the proposed methodology used for this project as seen from Fig.1.

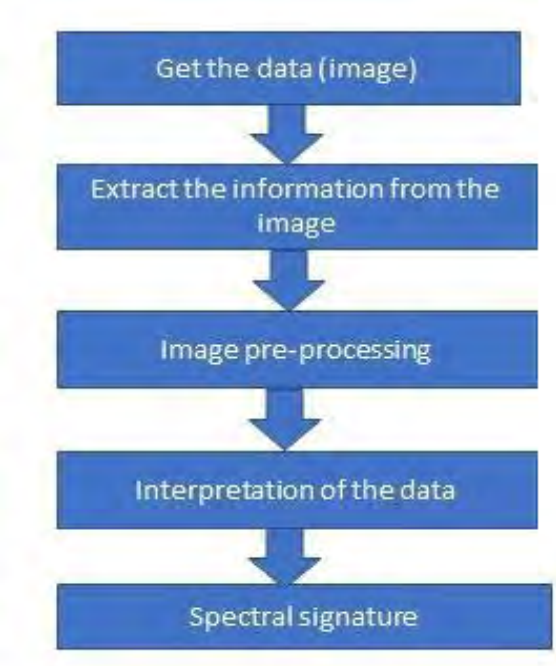


Fig. 1. Block Diagram

V. LOCAL SURVEY RESULTS

This local survey was conducted with participants being our friends and residents and through this we could conclude that not everyone is aware about the accurate reasons for Depletion of Water Resources even after facing water scarcity.

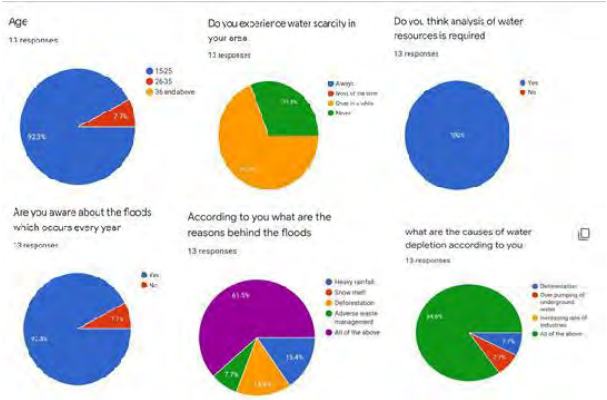
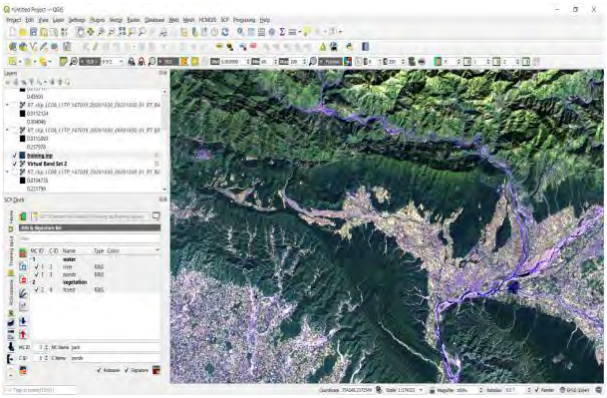
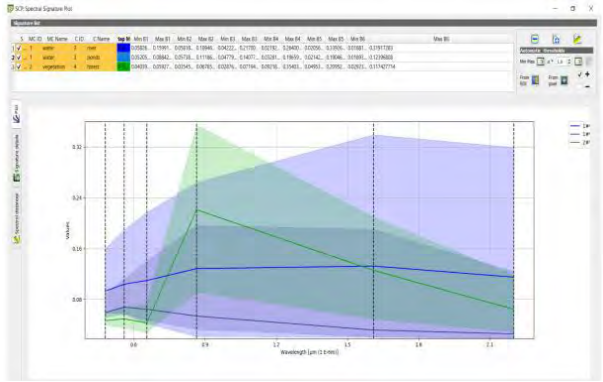


Fig. 2. Survey Results

VI. RESULTS





VII. CONCLUSION

Water is one of the most important natural resources which is key to our life. Though most of the Earth area is filled with water, only small amount of water is available for the drinking purpose. Various water conservation techniques have been used till now. But management of water resources is necessary for accomplishing this task in an effective way. Water detection through satellite images is one of the

promising areas for conserving the water through proper management. In this paper, we have reviewed various water detection techniques implemented by the researchers. Image processing is one of the significant parts of every remote sensing technique to get effective results.

REFERENCES

[1] N. Mueller, A. Lewis, D. Roberts, S. Ring, R. Melrose, J. Sixsmith, and A. Ip. Water observations from space: Mapping surface water from 25years of Landsat imagery across Australia. Remote Sensing of Environment, 174, pp: 341-352. 2016.

[2] V. Klemas, & A. Pieterse. Using Remote Sensing to Map and Monitor Water Resources in Arid and Semiarid Regions. The Handbook of Environmental Chemistry, pp: 33-60, 2015

[3] S. Madhavan, J. J. Qu, & X. Hao, Saharan dust detection using multi-sensor satellite measurements. Heliyon, Vol. 3, Issue. 2, 2017.

[4] C. Arvind, A. Vanjare, S. Omkar, J. Senthilnath, V. Mani, & Diwakar, P. Flood Assessment using Multi-temporal Modis Satellite Images. Procedia Computer Science, 89, 575-586, 2016.

[5] M. El Bastawesy, R. R. Ali, D. M. Deocamp, & M. S., Al Baroudi. Detection and Assessment of the Waterlogging in the Dryland Drainage Basins Using Remote Sensing and GIS Techniques. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, Vol. 5, Issue, 5, pp: 15641571, 2012.

This page is kept blank intentionally

Traffic Management System for Emergency Vehicles

Prathu D. Garg
Dept. of Electronics and Telecommunication Engineering
Thakur College of Engineering and Technology
Mumbai, India
prathugarg95@gmail.com

***Abstract*— There has been significant development in the field of traffic management ever since the boon of image processing and vehicle-to-vehicle (V2V) communication. The major drawback of image processing and V2V communication systems is that these involve hard-core coding and usage of really precise hardware, which in turn makes the system really complex and costly. To reduce this complexity and cost, the proposed system can be used. The proposed system uses laser communication and not traditional RF communication, primarily because it is faster, more accurate and does not pose the problem of RF interference. Essentially the system recognizes the presence of an emergency vehicle on road once the vehicle is in the line-of-sight of the laser receiver and upon detection, the system executes certain predefined protocols which facilitate uninterrupted passage to the emergency vehicle.**

Keywords*— *Traffic management, traffic optimization, laser communication, emergency vehicles, traffic signal, traffic alert, traffic notification

I. INTRODUCTION

Improving emergency response times is extremely critical, particularly for fire and health-related incidents. However, when the number of vehicles increases at an intersection, this not only increases the response times of emergency vehicles but also increases the likelihood of accidents occurring when emergency vehicles enter intersections at high speed. For example, in Ireland, an average of 700 fatalities are recorded every year because of late ambulance responses. The National Highway Traffic Safety Administration in the US released a report regarding accidents that involved emergency vehicles such as fire trucks, ambulances, and police cars. The agency studied the number of ambulance accidents over the 20-year period of 1992-2011 and estimated that an average of 1,500 accidents involving ambulances occurred each year, wherein 33 people were killed and 2,600 people were estimated to be injured. According to the report, fire engine accidents are the second leading cause of death for fire fighters. There were roughly 31,600 accidents involving fire vehicles over a 10-year period in which 630 fire-fighters were killed. In addition, it is reported that there are approximately 300 fatalities in the US each year during police pursuits, where 30% of the fatalities comprise people not involved in a pursuit. Therefore, reducing emergency response times by minutes or even seconds is crucial in emergency situations.

In all the above cases, traffic density and its obstruction to the emergency vehicle at both- the road and traffic signal, has been the prime cause of fatalities.

Unlike western countries, Indian cities do not have separate lanes for emergency purpose due to lack of road planning and infrastructure. As a result, the emergency services vehicles often get stuck at the traffic signals where other vehicles try to squeeze into all the available space so as to move ahead as soon as the signal turns green. The traffic congestion can also be caused by large red-light delays. Once the proposed system recognises the presence of an emergency vehicle, all the vehicles in the vicinity should be notified so that a lane of the road can be left unobstructed for the emergency vehicle to pass by. In case of road intersections where majority of the delay is caused by congestion due to traffic signals, this system optimizes traffic signals for the smooth passage of emergency vehicles.

II. LITERATURE SURVEY

[1] Kapileshwar Nellore, G.P. Hancke, "*Traffic Management for Emergency Vehicle Priority Based on Visual Sensing*", Nov 2016, DOI:10.3390/s16111892
Methodology: Image and Video processing- an approach to calculate the distance between the emergency vehicle and road intersection using a real-time video feed from the cameras installed at the intersection.
Drawback: Installation cost is high if the cameras used are precise. To reduce the installation cost, using sub-standard cameras will reduce the accuracy of detection, thus increasing the response time of the system. A trade-off between accuracy and any other parameter is undesirable for any system, especially in a system involving emergency vehicles.

[2] Dasari Vishal, Rishika J. Reddy, Bala Abhirami M, "*Real Time Traffic Control for Emergency Service Vehicles*", Dec 2017, DOI:10.1109/ICCIC.2017.8524354
Methodology: GPS enabled communication- an algorithm is created to govern the traffic signal optimization based on distance of the emergency vehicle from the road intersection taken from the GPS feed of that vehicle.
Drawback: The system depends on a Traffic Control Center (TCC) which optimizes the traffic signals in a particular locality. Therefore, any technical glitch at the TCC will hamper the functioning of all traffic signals in the area. The system uses inter-vehicular communication to alert the nearby vehicles of an emergency vehicle. Hence the system has high complexity and cost involved during both- installation and maintenance.

[3] M.E. Harikumar, M. Reguram, Prathyush Nayar, "*Low Cost Traffic Control System for Emergency Vehicles using Zigbee*", Oct 2018, DOI:10.1109/CESYS.2018.8724035
Methodology: RF Communication- the system operates on RF communication between two vehicles and between a vehicle and on-road infrastructure.
Drawback: Emergency vehicle data is being transmitted from vehicle to vehicle on the road until it reaches the traffic signal unit. Thus, each vehicle can be considered as a node in the communication system. If there is a glitch at any of the nodes, the entire communication system fails.

[4] Ajmal Khan, Farman Ullah, Zeeshan Kaleem, "*EVP-STC at Intersections Using Internet of Things Platform*", Nov 2018, DOI:10.1109/ACCESS.2018.2879644
Methodology: Internet-of-Things- the system involves communication of emergency vehicle with the on-road infrastructure using Internetwork.
Drawback: Apart from high complexity and cost of installation, the system is prone to hacking.

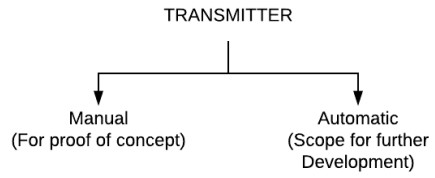
III. METHODOLOGY

The system uses laser communication technique to identify the presence of an emergency vehicle. There is a laser transmitter attached to an emergency vehicle. The laser receiver is placed at different intervals of the road and at traffic signals. Whenever the transmitter comes in the line of sight of the receiver, detection shall take place. In case of roadside receivers, a display or any such alert mechanism shall be placed to notify other drivers of the upcoming emergency vehicle. In case of traffic signal, along with the alert mechanism as mentioned above, the signal must immediately turn 'green' so that it does not create an obstruction to the smooth passage of the emergency vehicle.

IV. SYSTEM ARCHITECTURE

The proposed system is based on a basic communication model- the data flows from a transmitter to a receiver via a medium. In this system a laser beam, i.e, light acts as a medium for data transfer. The data that is transmitted here is nothing but the confirmation of the presence of an emergency vehicle stuck in traffic. The following events, like triggering of the alert system and turning the traffic signal to 'green', are completely dependent on the above mentioned confirmation.

The architecture of the proposed system is as follows:
1) The **Transmitter** Block: This block consists of a transmitter circuit. The identified types of a transmitters for this particular system are as follows:



a) *Manual Transmitter:* This is a readily available laser pointer that is operated by the immediate passenger in the emergency vehicle. The passenger has to point the beam of laser at the receiver to activate the system. This is to be used in the initial development of the system, to provide a proof of concept.
Advantages:

- Easy to implement
- Does not consist of an encoder and amplifier
- Cost effective
- Line of sight for the receiver is easily achieved

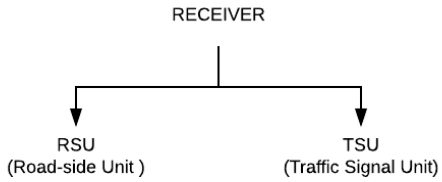
Disadvantages:

- Not a secure mode as anyone can trigger the system by using the readily available laser pointer device.
- The entire system depends on manual operation.

b) Automatic Transmitter: This is a microcontroller based transmitter. This provides a set of on-board I/O's which shall be used to integrate the laser pointer with servo motors so as to detect the receiver and hence

establish a line of sight automatically. The microcontoller also adds new avenues like Internet of Things and GPS integragtion. It also provides a way to receive a feedback at the emergency vehicle for the successful activation of the system. This is to be developed later, after successful implementation of the system with a manual transmitter thus providing a scope for further development.

2) The **Receiver** block: This block consists of the receiver circuit. This is the only block that needs to be implemented during the initial development of the system. This is a microcontroller based circuit. The input to this circuit is provided by a set of photocells, like LDR/ photodiode/ solar panel, as the sensing element. Hence the line of sight should be established between the transmitter and the sensing element at the receiving end. The output of these photocells is fed to the processing unit. Processing of sensor data is important so as to distinguish between the laser beam and other light-sunlight, light from street lamps etc, received at these sensors. The processing will also trigger the desired output, which in this system is optimization of traffic signal and an alert to nearby vehicles. The identified types of a receiver for this particular system are:



a) Road-side Unit: This is the receiving unit that must be installed along the road at regular intervals. The range of the transmitting laser varies from device to device. Once an appropriate transmitting laser is selected, the intervals of RSU installation can then be easily determined, and vice-versa. The purpose of this unit is to provide alert to nearby vehicles of the upcoming emergency vehicle in the form of a display message and/or alert 'siren' sound. Hence the output of this unit is fed to an LED display and/or speaker, which shall be installed along the road as well. The above mentioned process is depicted in the following process flow diagram:

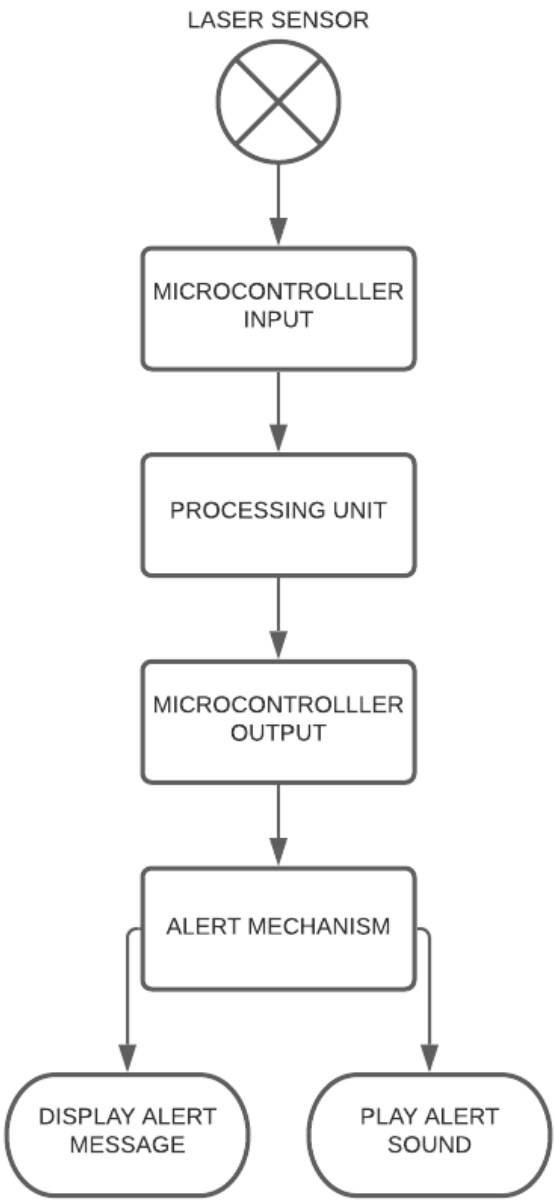


Fig.1: Process flow diagram of RSU

b) Traffic Signal Unit: This is the receiving unit that must be installed at the traffic signal. The primary purpose of this unit is to optimize the traffic signal for the unobstructed passage of emegency vehicles. The above mentioned alert mechanism of the RSU can also be integrated as a secondary output. The optimization of traffic signal is rather easy. No separate algorithm for the same is needed. All that needs to be done is to reset the existing algorithm so that the first 'green' state of the signal appears immediately on the signal that has received the laser transmisssion. If the time for this 'green' state is insufficient for the emergency vehicle to pass the junction, one can always retransmit the laser so as to reset the traffic signal again. The above mentioned

process is depicted in the following process flow diagram:

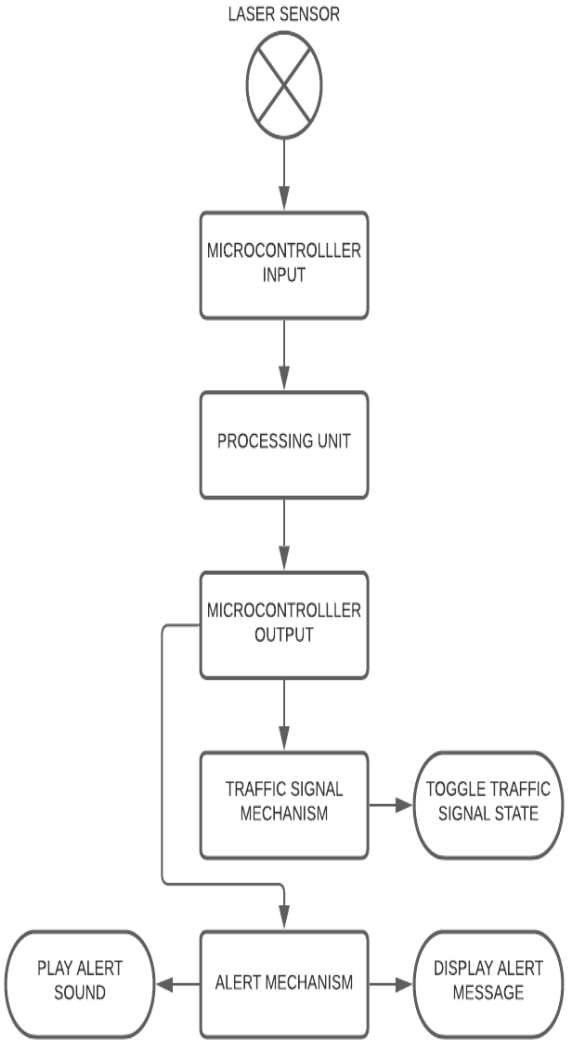


Fig.2: Process flow diagram of TSU

V. ALGORITHM OF TRAFFIC SIGNAL UNIT

Step 1: Start.
Step 2: Initialize I/O's.
- a. Analog input- sensing element.
- b. Digital output 1- traffic signal.
- c. Digital output 2- alert display.
- d. Digital output 3- alert sound.

Step 3: Set I/O pins of microcontroller.
Step 4: Initialize interrupt sequence.
- a. Set a threshold value.
- b. Accept signal from analog input.

Step 5: Initialize main sequence.
- a. The regular management of traffic signal at a junction.

Step 6: Compare signal value from analog input with the threshold value.
Step 7: If analog input > threshold, jump to step 8, else jump to step 5.
Step 8: Initialize interrupt protocol.
- a. Turn traffic signal to 'green' only for the one that received the laser input at the sensing element.
- b. Turn traffic signal to 'red' for the remaining ones.
- c. Display alert message on the lcd screen.
- d. Play alert sound on the speaker.

Step 9: Delay for the emergency vehicle to pass.
Step 10: Jump to step 5.

VI. FLOWCHART OF TRAFFIC SIGNAL UNIT

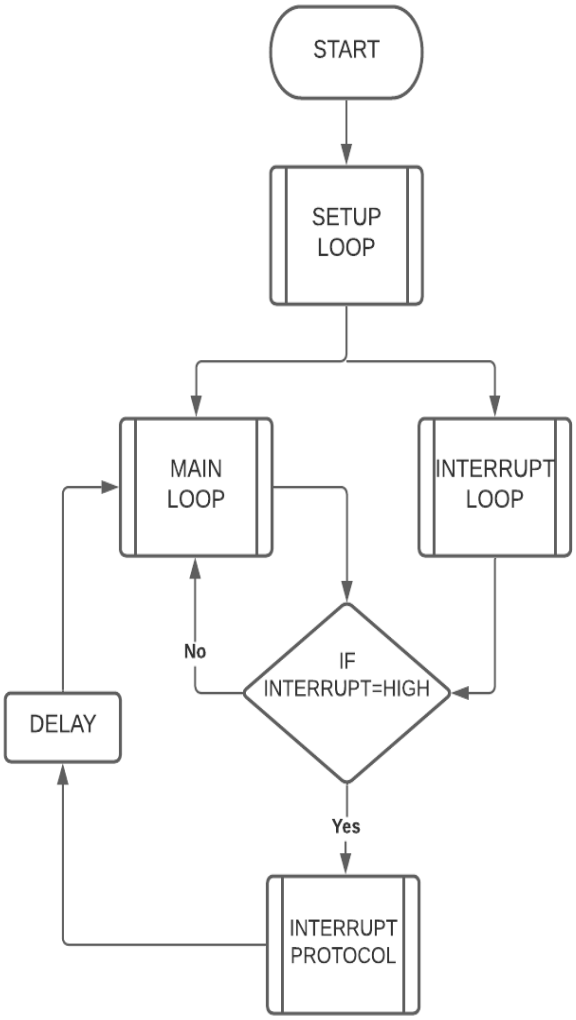


Fig.3: Flowchart of the TSU code

VII. Algorithm of roadside unit

Step 1: Start.
Step 2: Initialize I/O's.
   a. Analog input- sensing element.
   b. Digital output 1- alert display.
   c. Digital output 2- alert sound.
Step 3: Set I/O pins of microcontroller.
Step 4: Initialize main sequence.
   a. Set a threshold value.
   b. Accept signal from analog input
Step 5: Compare signal value from analog input with the threshold value.
Step 6: If analog input > threshold, jump to step 7, else jump to step 5.
Step 7: Initialize alert protocol.
   a. Display alert message on the lcd screen.
   b. Play alert sound on the speaker.
Step 8: Delay for the emergency vehicle to pass.
Step 9: Jump to step 5.

VIII. Flowchart of roadside unit

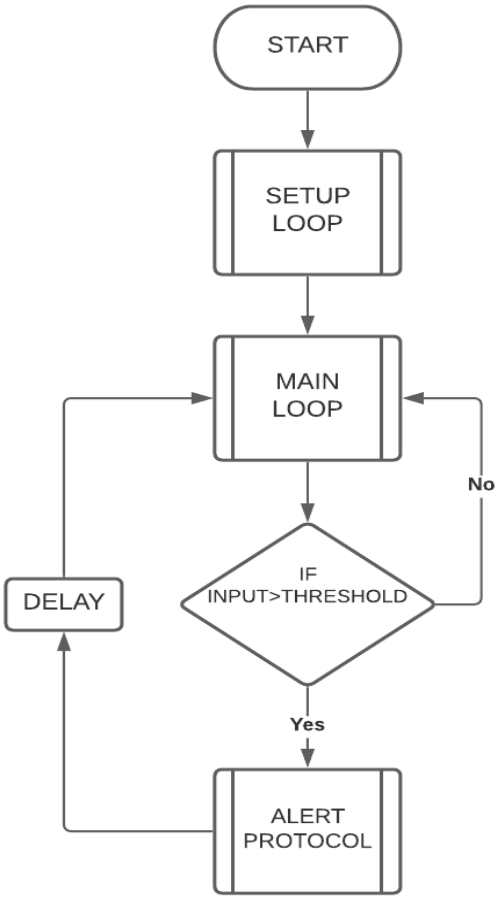


Fig.4: Flowchart of the RSU code

IX. Ease of use

1) Categorization: The system can quickly identify the type of vehicle- Emergency or Non-Emergency, as the transmitters are installed only on the emergency vehicles. Implementation of this system is much more convenient as it does not rely on the populace to install the transmitters, as opposed to RF communication, where presence of RFID in almost all vehicles (now a days) makes it difficult to categorize the vehicle with minimum response time.
2) Transmitter: For the proof of concept, a laser pointer can be used as a transmitter. This is because the only data to be transmitted is the presence of an emergency vehicle, which is simply a beam of light from the laser.
3) Receiver: A microcontroller-based receiver can be used. For the sensing element, a photodiode or any such light sensor can be used. This sensor is the only input to the receiver microcontroller. The output of the microcontroller is different for the Roadside Unit (RSU) and the Traffic Signal Unit (TSU), both of which comprise of readily available hardware and require minimal coding.
4) Communication: For the proof of concept, the immediate passenger in the emergency vehicle shall operate the laser pointer, physically, to establish a line-of-sight whenever the receiver is visible to the passenger. The sensor of the receiver shall be placed behind a convex lens so that with a greater surface area of the lens, the passenger does not have to struggle with aiming at the sensor. Once this line-of-sight is established, communication has taken place and the emergency protocol is immediately activated.
5) Hardware: The proposed system is a communication system, yet the transmitter does not require an encoder and modulator as a light beam is sufficient to transmit the data of 'presence'. Consequently, the receiver does not require a demodulator and a decoder. Also, cheap and readily available components can be used for I/O's of the receiver microcontroller.
6) Software: For traffic signal optimization and alert at the TSU, a mere 'interrupt' is added to the already existing traffic signal code. For alert at the RSU, a basic conditional iteration sequence of 'if' is used.

X. Future scope

1) The proposed system consists of human intervention, i.e, the system is triggered by the immediate passenger in the emergency vehicle. After the successful implementation of the proof of concept an automatic transmitter can be implemented. The automatic

transmitter makes the proposed system free from human intervention.

Google Maps. Based on this GPS feed a user can act in the emergency situations and

take appropriate measures to mitigate the issue until the emergency vehicle arrives.

3) The proposed system needs significant development in terms of security. If a readily available laser pointer is used then anyone with such a laser device can trigger the system.

4) The output of the alert mechanism of the proposed system can be used for commercial purpose as well. The screens used here can be considered as a source of viable advertisement when the alert mechanism of the system is not triggered.

XI. Conclusion

The proposed system overcomes the drawbacks of earlier systems, mentioned in Section II of this document, by:

1) A trade-off between cost and accuracy is eliminated as the cost of the proposed system is much lower. This is because high accuracy components are available at much lower prices as compared to the previous systems.

2) The complexity is extremely low as compared to previous systems as the proposed system involves communication only between the emergency vehicle and the on-road infrastructure.

One can also integrate GPS technology with the transmitter. Thus, the GPS feed from the transmitter

3) During the initial development, the threat posed by internet security is irrelevant. If only IoT application is integrated, the threat of internet security is introduced.

References

[1] Kapileshwar Nellore, G.P. Hancke, "*Traffic Management for Emergency Vehicle Priority Based on Visual Sensing*", Nov 2016, DOI:10.3390/s16111892

[2] Dasari ishal, Rishika J. Reddy, Bala Abhirami M, *Real Time Traffic Control for Emergency Service Vehicles*",Dec2017, OI:10.1109/ICCIC.2017.8524354

[3] M.E. Hrikumar, M. Reguram, Prathyush Nayar, *Low Cost Traffic Control System for Emergency Vehicles usingZigbee*",Oct 2018,DOI:10.1109/CESYS.2018.8724035

[4] Ajmal Khan, Farman Ullah, Zeeshan Kaleem, "*EVP-STC at Intersections Using Internet of Things Platform*", Nov 2018, DOI:10.1109/ACCESS.2018.2879644

Green Campus using IoT

Yashi Rajesh Chaturvedi
Department of Electronics and Telecommunication Engineering Thakur College of Engineering and Technology
Mumbai, India
Email: chaturvediyashi00@gmail.com

Amal Premdayal Mehta
Department of Electronics and Telecommunication Engineering Thakur College of Engineering and Technology
Mumbai, India
Email: amalmehta00@gmail.com

Bhavesh Pratap Purohit
Department of Electronics and Telecommunication Engineering Thakur College of Engineering and Technology
Mumbai, India
Email: purohitbhavesh912@gmail.com

Ms. Sukruti Kaulgud
Department of Electronics and Telecommunication Engineering Thakur College of Engineering and Technology
Mumbai, India
Email: sukruti.kaulgud@thakureducation.org

***Abstract*—Globally, the demand and cost of the energy are increasing rapidly due to growth in population and economy. The rise in the economic prosperity of the nations has resulted in the depletion of energy resources. The reduction in consumption of energy has become the necessity of the time, especially in India, which ranks as the third-largest consumer of energy. The paper aims to reduce electricity consumption as well as meet the energy demands. This can be achieved if we control and monitor energy consumption on the campus with the capabilities of the Internet of Things. Any device can be connected to the Internet and to other connected devices with the help of the Internet of Things. Thus, acquiring data from various sensors placed on the college campus for controlling and monitoring the electricity consumption and transmitting it to a cloud platform for further processing and analysis is possible. The real-time data from the IoT (Internet of Things) can be viewed by the customer, which can help in optimizing energy consumption and subsequently reduce the electricity bills. In a college campus, the lights and the air conditioners consume most of the electricity, therefore they have been taken as the prototype to validate the proposed architecture.**

Keywords—Internet of Things, Energy Efficiency, Green Campus, Energy Management, Cloud

I. INTRODUCTION

The population of the world is increasing rapidly and therefore, the consumption of electricity has also increased. The increase in the energy demands has led to an increase in the greenhouse emissions. Today, the energy can be produced from a variety of resources, which are renewable and non-renewable resources. If we start using renewable sources of energy, we will accomplish the goal of shifting towards green. India is rich in both conventional and non- conventional resources, but still, 75.31% of the electricity is produced from coal, because of its availability, suitability and relatively low cost. Although alternative sources of energy are available, it is difficult to replace coal with them on a larger scale.

The electricity consumption can be reduced if we avoid the unwanted wastage of the electricity. This will reduce the greenhouse emission as well as cut down the costs. This can be achieved if we carefully monitor and control the consumption of electricity on our campus. The Green Campus using IoT will provide energy efficient ways to reduce the carbon emissions in the existing systems.

In [1], various sensors were distributed in the campus, the data received by the sensors were transmitted to the base station by wireless transmission protocol. However, in [2], The sensor nodes are deployed randomly by considering the minimal distance between two sensor nodes. Sensor nodes are interfaced through a NodeMcu IoT based platform and connect to the cloud server through an IEEE 802.11 based architecture. The sensor nodes will transmit data using the transport protocol. The online cloud (Veeble server) will send temperature data, water consumption data. On the other hand, Anthony Emeakaroha and et al. in [3] The sensored transfer of the energy consumption data to the central server via an internet-enabled gateway in real-time through the concentrator. The concentrator is the initial data processor, which processes the data and stores it temporarily before passing it to the Ethernet TCP/IP hub. The Ethernet TCP/IP hub is the “access routing” data routing gateway, which enables the upload of electricity usage data over the internet to a centralized server for processing, storage and access via a dedicated and persuasive web interface. A Green Campus System was developed in [4] which consisted of MDA100 sensor boards which interfaced temperature and light sensors. Two pairs of IR Sensors were used to count the number of people entering and leaving the class. In [5], a wireless sensor network system design was developed with the help of Raspberry Pi and Arduino Uno for monitoring the environment. The challenges and limitations of IoT based Models for Smart Campus were discussed in [6]. The authors of paper [7] designed a prototype of a wireless environmental monitoring system to upload information from the array of sensors to the database, to be part of our smart campus project in Universitas Udayana. In [8], an IoT based Home Monitoring system was designed to conserve energy.

The proposed paper presents an architecture for IoT based Green Campus. The design will consist of sensors for checking the light, temperature, air conditioner and checking people’s presence. The consumption of electricity will be monitored and controlled with the help of web-client and mobile clients remotely. The energy

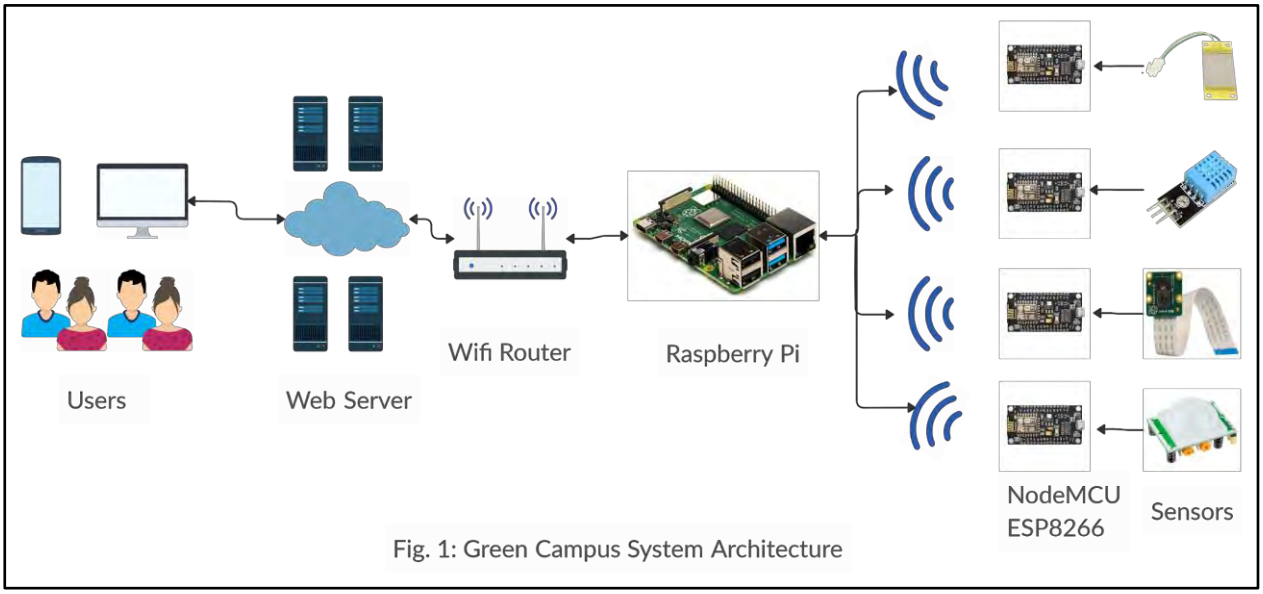


Fig. 1: Green Campus System Architecture

consumption will be under record. This will help reduce the cost of electricity consumption in the campus and thereby a reduction in the emissions of the greenhouse gases.

II. System Design - Proposed Model

A. System Design

Green Campus will consist of Hardware and Software which also includes cloud storage. The proposed model will compose of sensors and actuators which are distributed on the campus. These sensors and actuators will be connected wirelessly. Each sensor node will be a combination of sensors and NodeMCU. The Raspberry Pi will control the sensor nodes. The sensor nodes will consist of a group of sensors which collects data and sends it to the Raspberry Pi with the help of the MQTT protocol. The data collected will be stored in cloud storage. This data will be available to the users as web-client and mobile-clients.
The mobile application will be developed using Android Studio, coded using XML and Java Languages. The stored data from the database (MySQL) will be presented on the Mobile Application. The Android Mobile Application connects to the database with the help of PHP.

The architecture mainly comprises of four layers (Fig. 2):

- Perception Layer: It will gather data from physical objects like sensors and actuators.
- Network Layer: The captured data will be sent to the cloud, which will be stored with the help of WiFi.
- Middleware Layer: In this layer, processing of the data will take place and the output signal will be sent to the actuators.
- Application Layer: This layer will be used for proper Graphical Representation of the Data on the Web-Applications and Mobile-Applications

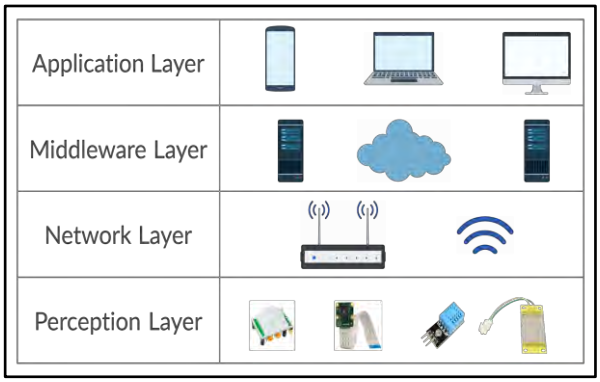


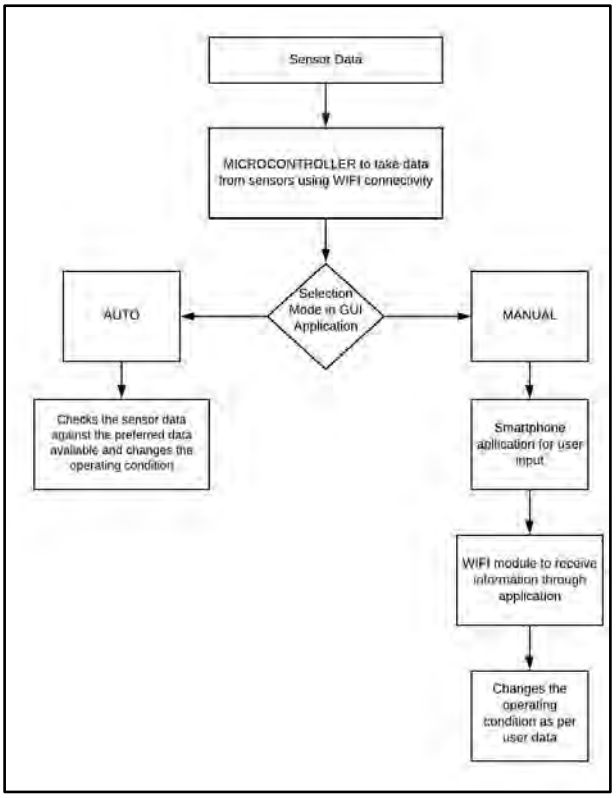
Fig. 2: Illustration of the layer-based general architecture

B. Working of the Model

A pair of PIR sensors will be used to collect the information of people entering or leaving the room. The pressure sensor will be used on each chair to check whether the person is using the computer. The Raspberry Pi Camera will be used to capture the data and identify the people along with their locations in the room. The temperature and humidity sensor will check the temperature of the room.

The system will periodically check the occupancy of the people in the room and accordingly give the signal to the relay which will turn on and off the electric appliances. The relay node here will behave as an actuator. The real-time status will be provided to the user with the help of GUI Applications which will collect the data stored in the Cloud Storage.

The users (using Mobile and Web application) will have the freedom to either manually control the appliances or they can opt for pre-programmed automated control of appliances. If the electricity consumption exceeds the limit and if there is a system failure, an alert will be generated and it will be notified to the user.



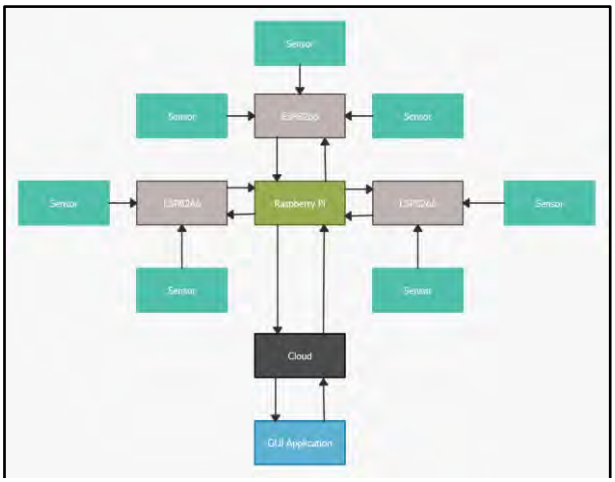


Fig.3: Block Diagram

Fig. 4: Flow Diagram

III. Expected Result

We will be deploying the system in a laboratory on our campus, the deployment will include PIR sensors, Pressure sensors, Temperature and humidity sensors, Raspberry Pi Camera Module, ESP8266 Wi-Fi module and Raspberry-Pi. All the sensors will be co-ordinated with Raspberry-Pi via ESP8266 Module.

ESP8266 being the coordinator, it will transmit the data of the sensing units to Raspberry-Pi and further, the data will be sent to the cloud storage. By observing the real-time insights, the user will be provided with the Information about various parameters in form of Graphs and Count of Occupancy of the respective laboratory via GUI Application. With the help of this, the user can change the operating conditions of any Electrical Appliance.

The expected output of the system is:

1. Savings: The monitoring of electrical appliances (by viewing the consumption of electricity) will help us to control its electricity usage and as a result lead to savings.
2. Ease of Controlling: Complete and semi-automation facility will help the user to control the appliances remotely.
3. User Comfort: The devices will be controlled by the user without moving to the location.
4. Security: It will provide effective monitoring of the existing system. If the consumption limit will exceed the set limit, then an alert will be generated and the user will be notified for the same.
5. Minimized Supervision: In the existing system, if there is a system failure, then the user has to identify the problem by himself. In the proposed model, if there will be a system failure, the user will be notified and in that case, the identification of the problem will become easier.

IV. Conclusion

The design of sensors, network system and the cloud system are a critical part of the proposed system. The sensor system will help to provide real-time data, the network system will help to ensure connectivity and security and the cloud system will help to handle the overall stored data. This paper has also discussed the possible solutions to reduce the energy consumption and cost bill either by automation or monitoring.

Our System has fulfilled the objectives of providing real-time automation, real-time consumption of electricity, making it cost-effective, enhancing the security, sending alerts for malfunctions.

Our system is proposed for the college campus, but it can, later on, be extended to other sectors like offices, hospitals, hotels and other huge power consumption industries.

As future work, the design can be extended in a number of different aspects. Different sensing modalities can be included to monitor various other monitoring applications. The web interface can be improved to implement better data visualization. Instead of using Raspberry Pi, we can use BeagleBone which is a combination of both Raspberry Pi and Arduino.

References

[1] B. Wang, K. Lu, P. Chang and S. Sun, "Multi-terminal monitoring system for campus ecological environment based on sensor network, " *10th International Conference on Computer Science & Education (ICCSE), Cambridge, 2015, pp. 107-110*, 2015.

[2] Thota Narendrakumar, Anju S. Pillai, "Smart Connected Campus, " *International Conference on Intelligent Computing,*

Instrumentation and Control Technologies (ICICICT), pp. 1591-1596, 2017.

[3] Emeakaroha, Anthony & Ang, Chee Siang & Yan, Yong, "Challenges in Improving Energy Efficiency in a University Campus Through the Application of Persuasive Technology and Smart Sensors, " *Challenges, vol. 3, pp. 290-318,* 2012.

[4] J. P. Dhivvya, V. M. Jayakrishnan, E. K. Thomas, M. V. Ramesh and P. Divya, "Towards energy conservation in campus using Wireless Sensor Network," *IEEE Global Humanitarian Technology Conference (GHTC), San Jose, CA, pp. 1-6,* 2017.

[5] S. G. Nikhade, " Wireless Sensor Network System Design using Raspberry Pi andArduino for Environmental Monitoring Applications," *The 9th International Conference on Future Networks and Communications, Procedia Computer Science, vol. 34, pp. 103-110*, 2014.

[6] Hossain, Imam & Das, Dipankar & Rashed, Md. Golam," Internet of Things Based Model for Smart Campus: Challenges and Limitations," *International Conference on Computer, Communication, Chemical, Materials and Electronic Engineering (IC4ME2)*, 2019.

[7] N. P. Sastra and D. M. Wiharta, "Environmental monitoring as an IoT application in building smart campus of Universitas Udayana," *International Conference on Smart Green Technology in Electrical and Information Systems (ICSGTEIS), Bali, 2016, pp. 85-88*, 2016.

[8] R. A. Alzafarani and G. A. Alyahya, "Energy efficient IoT home monitoring and automation system," *2018 15th Learning and Technology Conference (L&T), Jeddah, 2018, pp. 107-111*, 2018.

[9] M. Singh and S. L. Shimi, "Implementation of room automation with cloud based monitoring system," *2nd International Conference on Inventive Systems and Control (ICISC), Coimbatore, pp. 813-717*, 2018.

[10] C. Petrie, S. Gupta, V. Rao and B. Nutter, "Energy Efficient Control Methods of HVAC Systems for Smart Campus," *IEEE Green Technologies Conference (GreenTech), Austin, TX, pp. 133-136*, 2018.

[11] K. Sharma and T. Suryakanthi," Smart System: IoT for University," *International Conference on Green Computing and Internet of Things (ICGCIoT), Noida, 2015, pp. 1586-1593*, 2015.

[12] D Bharath Shankar, Balajee Maram, CH Hareesh Kumar, G Srikanth," A Framework for Green Campus Using Arduino Uno," *Journal of Advancement in Engineering and Technology, vol. 612.03,* 2018.

[13] Mehmet TAŞTAN ," Internet of Things based Smart Energy Management for Smart Home," *KSII Transactions on Internet and Information Systems Vol. 13, No. 6, 2019.*

[14] V. D. Vaidya and P. Vishwakarma, "A Comparative Analysis on Smart Home System to Control, Monitor and Secure Home, based on technologies like GSM, IoT, Bluetooth and PIC Microcontroller with ZigBee Modulation," *International Conference on Smart City and Emerging Technology (ICSCET), Mumbai, 2018, pp. 1-4*, 2018.

[15] Shinde, Samiksha," Monitoring of Green Campus with IoT," *International Journal for Research in Applied Science and Engineering Technology, pp. 3368-3371*, 2018.

[16] "ZigBee Vs. XBee: An Easy-To-Understand Comparison", url: https://www.link-labs.com/blog/zigbee-vs-xbee

[17] "Smart Home Networks: Wi-Fi vs. Bluetooth vs. Zigbee and Z-Wave | Time",url: https://time.com/3745059/smart-home-wireless-networks/

[18] "Blynk Reviews - Ratings, Pros & Cons, Analysis and more",url: https://getapp.com/emerging-technology-software/a/blynk/reviews/

OPFET under Solar (*AM0*) Illumination

Jaya V. Gaitonde
Electronics and Telecommunication Department
Goa Engineering College
(Goa University)
Farmagudi-Ponda-Goa-India, 403401
jayagaitonde46@gmail.com

R. B. Lohani
Electronics and Telecommunication Department
Goa Engineering College
(Govt. of Goa)
Farmagudi-Ponda-Goa-India, 403401
rblohani@gec.ac.in

***Abstract*—Green energy technology using solar energy is gaining importance over the recent years due to its renewable nature. The present scenario reveals that the photovoltaic modules and the photodiodes used for communication under solar illumination have limited 3-dB bandwidth in the sub-megahertz range. Also, they require separate optical sources for modulation. In this research work, we propose an OPFET (Optical Field Effect Transistor)-based photodetector which overcomes these limitations wherein modulated sunlight is used for communication. The proposed device with a GaAs surface-gate structure with front-illumination exhibits a 3-dB bandwidth of 1.386 GHz under air mass (*AM0*) solar illumination. The *AM0* spectrum is used for satellite, space vehicle, and space communication applications. The result analyses are based upon the photovoltaic, photoconductive, and the series resistance effects. The detector shows good prospects for solar-based communication applications.**

Keywords—Front-illuminated, OPFET, solar, green technology.

I. INTRODUCTION

Visible-Light Communication (VLC) has potential applications such as for robots in hospitals, Li-Fi (Light-Fidelity) Networks, information displayed on sign boards, underwater communication, and vehicle to vehicle communication [1]. The attractive advantages of VLC are no electromagnetic interference, unregulated large and free bandwidth, cost efficiency, energy efficiency, no safety and security issues, higher operation speed than Radio Frequency (RF), and can relieve congestion of RF traffic [2], [3]. There are numerous efforts towards Visible Light Communication under background solar illumination using solar cells [2], [4]-[6]. However, they either fail under high solar intensity or the system data rate is restricted to tens of Mbits/s. Further, these systems require separate Laser Diodes (LDs) or Light-Emitting Diodes (LEDs) as sources for communication purposes. As an alternative, we suggest to use modulated sunlight for communication. This idea has been implemented in [7], [8]. The modulated sunlight was first utilized in space communication [9]. Communication bandwidth of up to 10 MHz is recorded with further enhancement possible through optimization

The sunlight communication system is even now in its infancy. Instead, of simple photodiodes and photosensors used in [7], [8] to detect modulated sunlight, we can employ a FET based photodetector such as Metal-Semiconductor Field Effect Transistor (MESFET), also called as Optical Field Effect Transistor (OPFET). This device inherently possesses very high gain-bandwidth product allowing greater transmission distance. This device has been investigated in numerous works [10]-[18].

In this research work, we study the basic front-illuminated model of the OPFET photodetector for communication through modulated sunlight. We present features of the device such as photovoltage and photocurrent. These parameters are studied at different wavelengths and at a range of frequencies. The photovoltaic, photoconductive, and the series resistance induced effects explain the observed results.

At first, we present a brief theory of the OPFET device followed by the results, discussions, and analyses, and conclude with a summary of the work done.

II. THEORY

The schematic sketch of the OPFET model viz. the front-illuminated OPFET is presented in Fig. 1 [10]. In Fig. 1, 'M' stands for metal contact and 'SI' for semi-insulating substrate. The simulations consider uniform moderate doping of n-type channel and p-type substrate. The deep level chromium (Cr) impurity used for the substrate makes the substrate semi-insulating. The front-illuminated model is characterized by surface gate and illumination from the transparent gate side. Illumination of the device generates electron-hole pairs once absorbed in the neutral channel and depletion regions. Photogenerated electrons contribute to the current upon moving toward the channel, and drifting from source to drain on the application of the drain voltage (photoconductive effect). The holes contribute to the photovoltaic effect by

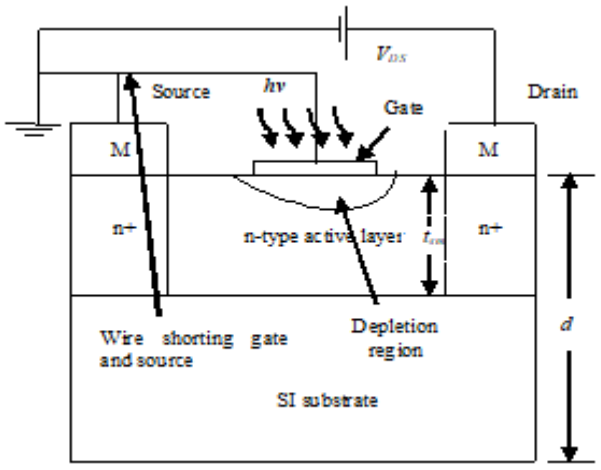


Fig. 1. The structure of the front-illuminated OPFET [10].

producing a photo-induced voltage across the metal-semiconductor junction upon crossing the junction. The photovoltage reduces the depletion width, and in turn, enhances the drain current.

Considering the moderately-doped channel and semi-insulating nature of substrate, the p-n junction width is zero on the channel side and maximum on the substrate side. Thus, the photovoltage at the p-n junction has no effect on the device characteristics.

The modeling of the front-illuminated device is presented in [14].

III. RESULTS AND DISCUSSION

We carried out simulations of the modulated sunlight *AM0* spectrum response of the GaAs OPFET front-illuminated model using MATLAB software suitable for space communication applications. The parameters used in calculation are as follows: Gate length (4 μm), gate width (150 μm), active layer thickness (0.3 μm), and doping concentration (4×10^{22} /m^3) [19]; low field electron mobility (0.52 m^2/(V.s)) [20]; Schottky barrier height (gold (Au)-GaAs)(0.865 eV) [21]; saturation electron velocity (~1.2×10^5 m/s) [11]; saturation hole velocity in the y-direction (~0.9×10^5 m/s); electron lifetime (1 μs), hole lifetime (10 ns) [11]; permittivity (1.14×10^{-10} F/m) [20]; absorption coefficient [22]. The *AM0* solar spectrum is represented in Fig. 2 [20], and the absorption spectrum of GaAs is depicted in Fig. 3 [22].

It is observed from the above graphs that the power density as well as absorption coefficient, are significantly high at visible to near-infrared wavelengths (NIR) (400 nm to 900 nm). Therefore, mostly the device responses will be limited to these wavelengths. Fig. 4 depicts the photovoltage-dependence on wavelength for the front-illuminated model at low (dc) and high frequencies. These plots clearly show the high response at visible-NIR wavelengths spanning from 400 nm to 900 nm. Apart from this, there are significant contributions at the Ultraviolet (UV) wavelengths of 250 nm to 350 nm. The observations are accounted by the high power density, moderately high value of absorption coefficient, and correspondingly a large enough absorption depth for substantial photogeneration to occur in the junction region with the carriers eventually crossing the Schottky junction. At Ultraviolet (UV) wavelengths, the absorption depth is very short due to very high absorption coefficients. Despite this fact, the photovoltage is significant at these wavelengths since the generation of carriers begins from the metal-semiconductor contact side inside the depletion region. In contrast, at wavelengths higher than 900 nm, the absorption coefficient drops considerably resulting in reduced photovoltage. The lower photovoltages at higher frequencies are due to the fact with the modulation of the incident radiation, the lifetime of carriers is also modulated and decreases after certain frequency. The front-illuminated model exhibits high photovoltage due to the additional factor ($\alpha v_y \tau_{\omega L}$) in the numerator of the photo-induced hole density equation [14] over the primary hole density which induces the amplification effect. One more aspect affecting the

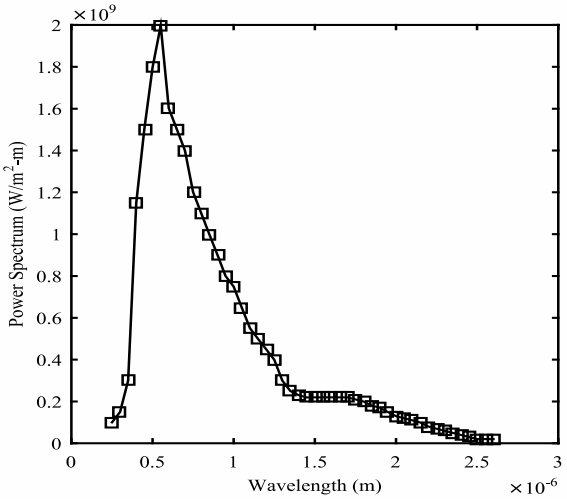


Fig. 2. Air mass (AM0) solar spectrum [20].

photovoltage is the factor ($\alpha v_y \tau_{\omega L}$) in the denominator term ($1-\alpha v_y \tau_{\omega L}$). The factor $\alpha v_y \tau_{\omega L}$ is to be treated as it is when $\alpha v_y \tau_{\omega L} < 1$ and is to be substituted with the nearest fractional value to unity when $\alpha v_y \tau_{\omega L} > 1$. This factor also contributes to high photovoltage. The high photovoltages result in large photovoltaic currents in the front-illuminated OPFET. In the discussion to follow, 'PV' stands for photovoltaic and 'PC' stands for photoconductive.

The solar spectrum has a range of wavelengths from 250 nm to 2600 nm. Thus, the solar response of the OPFET device is an integration of the responses at the individual wavelengths. The high average power density and the moderately high absorption coefficient greatly enhance the photoconductive charges and are comparable to the photovoltaic charges.

At the shorter wavelengths, the magnitude of photoconductivity is more in the neutral channel region and

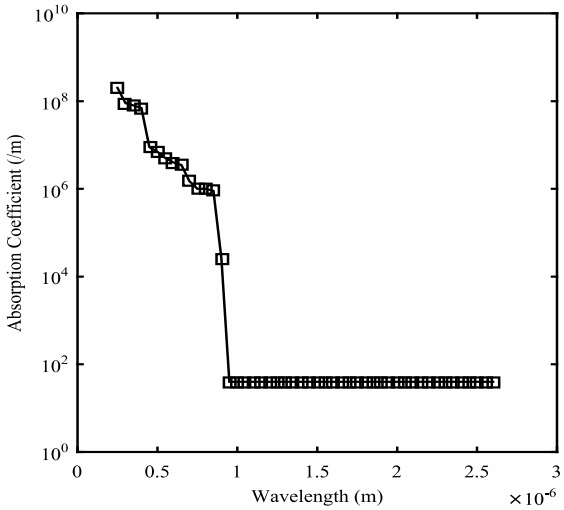


Fig. 3. Absorption coefficient of GaAs versus wavelength [22].

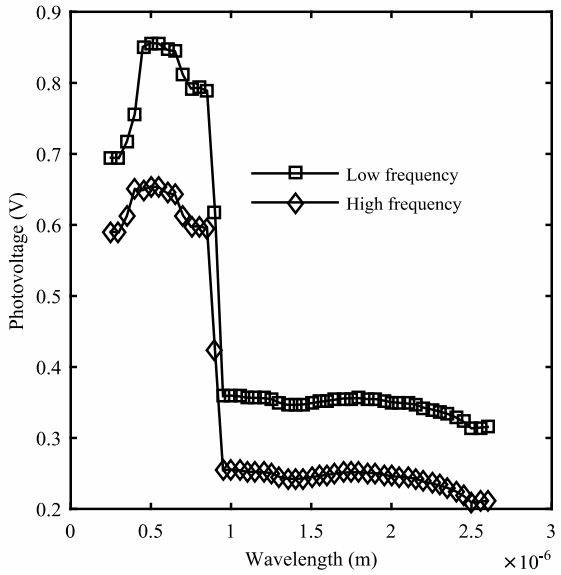


Fig. 4. Photovoltage-wavelength spectrum of front-illuminated model at low (dc) and high frequencies.

lesser in the depletion and substrate region along with lower photovoltaic effect. As the wavelength increases from 400 nm to 700 nm, the photoconductive contribution decreases and the photovoltaic contribution gradually increases accounting for the fall in series resistance. This is attributed to the wavelength-dependence of the absorption coefficient and absorption depth and to the value of diffusion length. The wavelength range 400 nm to 700 nm is purposely chosen since the response is the greatest at these wavelengths. At lower wavelengths, the absorption coefficient is larger than at higher wavelengths and vice versa for the absorption depth. Although the absorption begins from the metal contact side, the diffusion length is long enough along with high absorption coefficient to produce significantly high carrier density in the

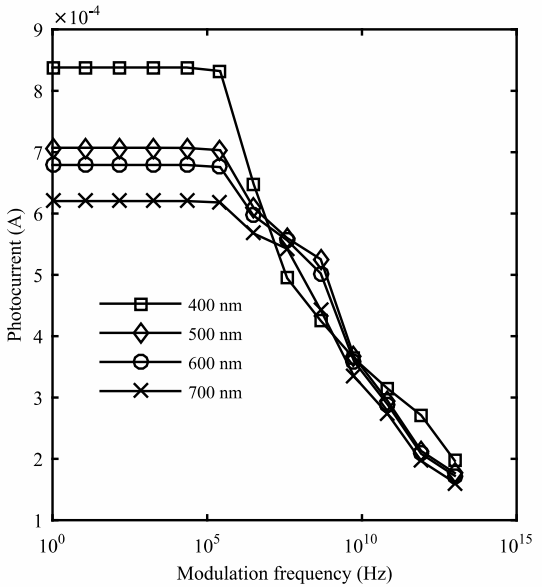


Fig. 5. Photocurrent versus modulation frequency at different wavelengths.

channel region at these wavelengths. These features are observed under dc conditions. As the frequency increases above dc levels, the photoconductive charges decrease significantly, and the photovoltaic charge dominates.

The transformation of the photo-induced charges into the photocurrent is depicted in Fig. 5. As is apparent from Fig. 5, at the majority of wavelengths, the photovoltaic effect has a greater impact, especially at higher frequencies resulting in a moderately high bandwidth of 1.386 GHz. The bandwidth would have been considerably more in the absence of photoconductive effect since the photoconductive lifetime is longer than the photovoltaic lifetime.

IV. CONCLUSION

We studied the air mass (*AM0*) modulated solar response of the GaAs front-illuminated OPFET suitable for space communication applications. The detector exhibited a 3-dB bandwidth of 1.386 GHz. This performance is critical of Li-Fi applications using modulated solar illumination. The present device will be useful as photodetector in future solar communication systems.

REFERENCES

[1] L. Khan, and L. Ullah, "Visible light communication: Applications, architecture, standardization and research challenges," Digital Communications and Networks, vol. 3, no. 2, pp. 78-88, May 2017.

[2] B. Malik, and X. Zhang, "Solar panel receiver system implementation for visible light communication," In 2015 IEEE International Conference on Electronics, Circuits, and Systems (ICECS), pp. 502-503. IEEE, 2015.

[3] O. Ergul, E. Dinc, and O. B. Akan, "Communicate to illuminate: State-of-the-art and research challenges for visible light communications," Physical Communication, vol. 17, pp. 72-85, Dec. 2015.

[4] N. Lorriere et al., "Photovoltaic solar cells for outdoor LiFi communications," Journal of Lightwave Technology, vol. 38, no. 15, pp. 3822-3831, Aug. 2020.

[5] S. Zhang et al., "Organic solar cells as high-speed data detectors for visible light communication," Optica, vol. 2, no. 7, pp. 607-610, July 2015.

[6] M. Kong et al., "Underwater wireless optical communication using a lens-free solar panel receiver," Optics Communications, vol. 426, pp. 94-98, Nov. 2018.

[7] R. Bloom, M. Zuniga, Q. Wang, and D. Giustiniano, "Tweeting with sunlight: Encoding data on mobile objects," In IEEE INFOCOM 2019-IEEE Conference on Computer Communications, pp. 1324-1332. IEEE, 2019.

[8] H. Guo et al., "A reliable sunlight communication system," Chinese Optics Letters, vol. 17, no. 12, pp. 120605, Dec. 2019.

[9] G. C. Mooradian, "Satellite mounted system for transferring information using modulated sunlight," U.S. Patent 4,573,214, issued February 25, 1986.

[10] S. Mishra, V. K. Singh, and B. B. Pal, "The effect of surface recombination on the frequency-dependent characteristics of an ion-implanted GaAs OPFET," IEEE transactions on electron devices, vol. 37, no. 4, pp. 942-946, April 1990.

[11] N. S. Roy and B. B. Pal, "Frequency-dependent OPFET characteristics with improved absorption under back illumination," Journal of lightwave technology, vol. 18, pp. 604-613, April 2000.

[12] J. Gaitonde and R. B. Lohani, "GaAs Optical Field Effect Transistor (OPFET): A High performance photodetector for automotive Applications," SAE International Journal of Passenger Cars-Electronic and Electrical Systems, vol. 9, pp. 204-211, April 2016.

[13] S. R. Saxena, R. B. Lohani, R. U. Khan, and B. B. Pal, "Generalized dc model of GaAs optical field effect transistor

considering ion-implanted profile," Optical Engineering, vol. 37, pp. 1343-1352, April 1998.
[14] J. V. Gaitonde, and R. B. Lohani, "Analysis of wide-bandgap material OPFET UV detectors for high dynamic range imaging and communication applications," Communications and Network, vol. 11, no. 4, pp. 83-117, Oct. 2019.
[15] J. V. Gaitonde, and R.B. Lohani, "Material, structural optimization and analysis of visible-range back-illuminated OPFET photodetector," Advances in Science, Technology and Engineering Systems Journal, vol. 4, no. 4, pp. 485-502, Aug. 2019.
[16] J. V. Gaitonde, and R.B. Lohani, "Structural optimization and analysis of GaAs buried-gate OPFET for visible-light communication," Opt Quant Electron, vol. 52, Nov. 2020.
[17] J. V. Gaitonde, S. P. S. Rawat, and R. B. Lohani, "Comparative Analysis of Buried-Gate GaN OPFET Models for UV Photodetector Applications," In 2018 5th IEEE Uttar Pradesh Section International Conference on Electrical, Electronics and Computer Engineering (UPCON), pp. 1-8. IEEE, 2018.
[18] J. V. Gaitonde, and R.B. Lohani, "Proposed GaAs and Si OPFET Photodetectors for Solar Cell Applications," 2nd International Conference on Non-Conventional Energy: Nanotechnology & Nanomaterials for Energy & Environment (ICNNEE), Dec. 2019.
[19] M. J. Golio, "Ultimate scaling limits for high-frequency GaAs MESFETs," IEEE transactions on electron devices, vol. 35, no. 7, pp. 839-848, July 1988.
[20] S. M. Sze, and K. K. Ng, (Eds.), "Physics of Semiconductor Devices," John Wiley and Sons, Hoboken, New Jersey, 2007, pp. 29, 721, 790.
[21] M. K. Hudait, and S. B. Krupanidhi, "Doping dependence of the barrier height and ideality factor of Au/n-GaAs Schottky diodes at low temperatures," Physica B: Condensed Matter, vol. 307, no. 1-4, pp. 125-137, Dec. 2001.
[22] M. Levinshtein, S. Rumyantsev, and M. S. Shur, (Eds.) "Handbook Series on Semiconductor Parameters (Vol. 1): Si, Ge, C (Diamond), GaAs, GaP, GaSb, InAs, InP, InSb," World Scientific Publishing Co. Pte. Ltd., Singapore, 1996, pp. 96-97.

An Analytical Analysis of High - κ Oxides in Nano-Scale CNFET Photodetector

Kalawati Patil
Research Scholar, Asst. Prof., E&TC
Thakur College of Engg. & Technology
Mumbai, India
kalawati.patil@thakureducation.org

Lochan J. Jolly
Dean Staff Student Welfare
Thakur College of Engg. & Technology
Mumbai, India
Lochan.jolly@thakureducation.org

B. K. Mishra
Principal
Thakur College of Engg. & Technology
Mumbai, India
tcet.principal@thakureducation.org

Abstract — **This paper analyses the effect of high -k oxides and its thickness on the quantum capacitance in single-wall carbon nanotubes (SWCNTs) based FET phototransistors (CNFET). Lowering the quantum capacitance is a major challenge to improve the photo performance of CNTFET phototransistors at 10 nm technology node. Lower quantum capacitance can be achieved for a larger tube's diameter by choosing the proper dielectric material and gate oxide thickness. Also, due to strong Columbic forces in low-dimensional SWCNT, under photo illumination, high energy excitons (~150 meV) are formed, which can be disassociated further by using high dielectric material in the surrounding of SWCNT. It is observed that the use of high dielectric oxides, HfO_2 and ZrO_2 shows an improvement in quantum capacitance and exciton dissociation rate as compared to low dielectric SiO_2 and hence in enhanced performance of CNFET phototransistor.**

Keywords - SWCNT, CNFET photodetector, Excitons, High-κ Dielectrics, Quantum Capacitance, photocurrent.

I. INTRODUCTION

The diverse applications that rely on photodetection technology require photodetectors with distinct properties. For an optimal performance of photodetectors: spectral sensitivity, response speed, and state-of-the-art photodetector systems can be tailored over several orders of magnitude by adopting new device architectures and material systems [1]. In this perspective, the recent advances in the field of low-dimensional photo-FETs (Field Effect Transistors) play a critical role. For photo-FET's high performance, the channel material should ideally possess high carrier mobility, a moderately large and direct bandgap. The newly discovered low dimensional nanomaterials exhibit numerous unique electrical and optical properties that can fulfill most photo-FET requirements. Among many nanomaterials, SWCNTs are considered one of the promising candidates in infrared photo-FETs due to their multifunctional optoelectronic properties and compatibility with complementary metal-oxide-semiconductor (CMOS) fabrication processing [2]. Sensitive photo-FET can be demonstrated by employing SWCNT as an active channel known as CNFET photodetector (CNFET PD).

Despite SWCNT's potential, CNFET PD's performance is yet not competent enough to photo-FETs comprising other nanostructured materials. Their low performance can be attributed to the strong binding energy of excitons in SWCNTs, which decreases the yield of photogenerated free carriers. The research in this field has just been inaugurated and under progress. It has been predicted that large exciton binding energies of 300-400 meV are present due to the strong spatial confinement of the 1D structure of SWCNTs with diameters on the order of 1-2 nm. Hence to obtain substantial photocurrent in SWCNT, excitons should be separated in free charge carriers by an external or internal built-in electric field before they relax to the ground state.

The analytical model developed for CNFET based on surface potential, and conduction band minima with 1D transport is developed. The model is optimum structural device parameters such as SWCNT diameter, bandgap energy, and supply voltage [1, 2]. The relatively low κ of SiO_2 (at 3.9) limits its use in CNFETs as gate lengths scales down to tens of nanometer scales. High - κ gate insulators afford high capacitance without relying on small thickness films, allowing for efficient charge injection into transistor channel reducing direct tunneling leakage effect [3]. This has motivated me to explore the integration of high - κ films ~ (20 – 30) as gate insulator. Therefore, CNTFET simulations are carried out considering the integration of thin-film HfO_2 with high κ dielectrics (~ 30) into CNFET [4]. This model is valid as long as the SWCNT is behaving as semiconducting.

This paper is organized as follows: The structure and necessary characteristics for CNFETs are discussed in Section II. Section III describes an analytical model developed for CNFETs. Section IV and V gives the results and discussion. Finally, a concluding remark is given.

II. II. THEORY

2.1 Device Structure

The CNFET structure under consideration is shown in figure 1. The CNFET adopted is a conventional back gated structure with a 100-200 nm long n-type SWCNT channel with appropriate contact materials and high dielectric thin gate oxides.

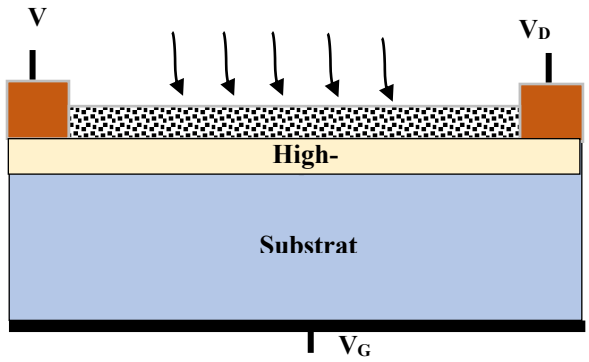


Figure 1. Back Gated Structure of CNFET with high dielectric gate oxide.

The contact between semiconducting SWCNT and metal is generally modeled as a Schottky barrier (SB), resulting from the Fermi level mismatch between semiconducting SWCNT and metal electrodes. For a typical n-type SWCNT transistor, the metal with high work function forms small SB height contact, where the Fermi level of the metal aligns well with the valence band of the SWCNT. The properties of the Schottky barriers are determined by the energy alignment between the metals and SWCNT. Hence metal work functions and gate bias play a significant role in deciding the CNFET photodetector performance [4]. Contact metal Au is used at the source and drain electrodes in the CNFET photodetector. To improve the optical absorption with exciton energy scaling, high dielectric materials such as ZrO_2 and HfO_2 thin films are employed as the insulator in CNFET.

Exciton binding energy E_b scales with the SWCNT radius r, effective mass m, and dielectric constant.

$$E_b = A_b\left(r/a_B\right)^{\propto-2}\left(m/m_e\right)^{\propto-1}\varepsilon^{-\propto}$$

(1)

Using equation in 1, the exciton energy is calculated for the following dielectric materials and listed in table 1.

Table 1: Exciton energy for different dielectric materials.

Dielectric Material	κ_{ox}	E_b(eV)
SiO_2	3.9	1.827
HfO_2	15.6	0.262
ZrO_2	19	0.199

2.2 Density of States in s-SWCNTs:

The chirality of tubes often dominates charge transport through SWCNT-based devices. Thus, information about the structural properties of SWCNTs is vital for modeling the nanotube-based electronic devices. The density of states for SWCNT can be calculated using the equation in [5, 6].

$$D(E) = \frac{a\sqrt{3}}{\pi^2 R V_{pp\pi}} \sum_{q=-\infty}^{\infty} \frac{|E|}{\sqrt{E^2 - E_{cmin}^2}}$$

(2)

Where $V_{pp\pi}$ is the carbon-carbon (C-C) tight-binding overlap energy, (3.033eV)

a is lattice vector magnitude (0.246 nm)
R is the radius of the nanotube.

Figure 2 indicates that nanotubes are unique materials because all of the bands have a direct bandgap. Thus, multiple bands can participate in direct optoelectronic events for a single nanotube, spanning a wide range of energies. Further advantage in SWCNTs comes from its reduced dimensionality, which results in low non-radiative recombinations.

Each SWCNT (n, m) has a unique set of interband transitions. Energies E_{ii} denoting the energy differences between the i-th conduction and valence bands, and optical transitions can only occur between these mirror sub-bands [5, 6]. These singularities are the unique feature of nanotubes and primarily responsible for many distinguished electronic and optical properties of SWCNTs. Many optical applications of semiconducting SWCNT require prior information of these optical transition energies.

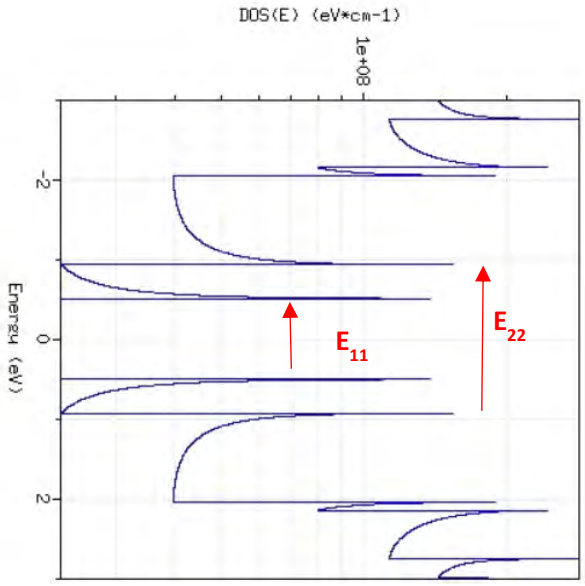


Figure 2. Schematic density of states diagram for s-SWCNTs, in a simple band theory model. Allowed optical transitions are illustrated as vertical arrows.

The tight-binding model with the nearest-neighbor approximation provides the following simple expression to calculate optical transitions of semiconducting nanotubes.

$$E_{ii} = \frac{2ja_{cc}\gamma_0}{d}$$

(3)

Where,

γ_0 is the nearest-neighbor hopping parameter,
a_{cc} =1.44 Å is carbon-carbon bond length,
d is SWCNT diameter in nm,
and j is an integer.

E_{ii} corresponds to different interband transitions (E_{11} , E_{22} , E_{33} , E_{44}….) of semiconducting SWCNT. Here, the first optical transition (E_{11}) is the bandgap of semiconducting SWCNTs and the second optical transition (E_{22}) facilitates various optical transitions as it falls within the visible energy range. Hence, for photoabsorption, the first two optical transitions are mainly considered. So, E_{11} and E_{22} of semiconducting SWCNTs are more significant than other transitions and are of more interest [6,7].

III. Analytical Model of CNFET

The mentioned steps shown in figure 3 are followed for the calculation for the I–V characteristics with necessary approximations [1,7].

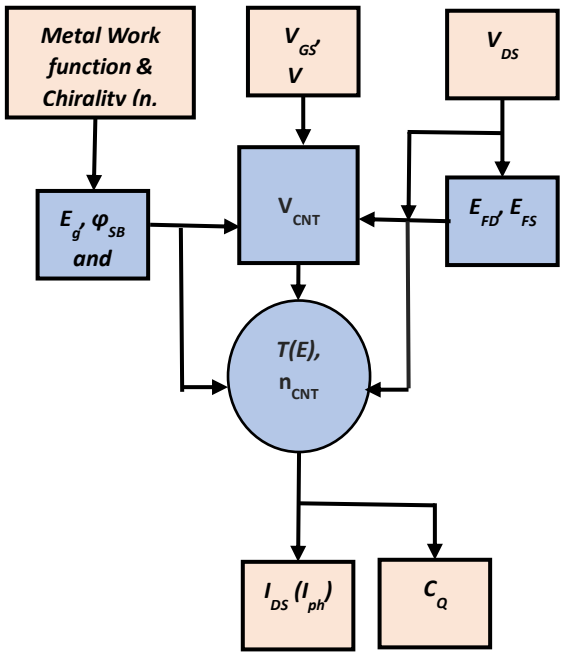


Figure 3. Steps for the proposed model

The photo-voltage across the Schottky junction is obtained using the following relation

$$V_{op} = \frac{KT}{q} ln\left(\frac{J_p}{J_s}\right)$$

(4)

The transport mechanism in SWCNT, which is dependent on the intrinsic charge carrier concentration [1] can be calculated as:

$$n_{SWCNT} = \int_{E_c}^{\infty} D(E) f(E) dE$$

(5)

D(E) and *f*(E) represent the density of states, Fermi–Dirac distribution in SWCNT, respectively. D(E) and *f*(E) values are calculated as:

$$D(E)dE = 2\sum_{1}^{All\ Bands} \frac{4}{\pi V_{pp\pi} a\sqrt{3}} \frac{E}{\sqrt{E^2 - E_c}} dE$$

(6)

E_C is the conduction band energy. The density of state value is calculated for the first sub-band only since in SWCNTs, the contributions of next level sub-bands is negligible.

$$f(E) = \frac{1}{1 - exp\frac{E - E_f}{KT}}$$

(7)

T is the operating temperature, K is the Boltzmann constant, and E_F is the first sub-band Fermi level value in SWCNT.

Where

$$N_C = \frac{8KT}{\pi V_{pp\pi} a\sqrt{3}}$$

(8)

And

$$I = \frac{1}{\sqrt{KT}} \int_0^{\frac{6E_C}{T}} \frac{(KT_X + E_C)}{\sqrt{x(KT_X + 2E_C)}} exp(-x) dx$$

(9)

Channel current calculation [12] is done using an expression in equation 9. Potential developed across SWCNT due to gate voltage (V_{GS}). The value for the required gate voltage can be calculated as:

$$V_{SWCNT} = V_{GS} - \frac{q_{SWCNT}}{C}$$

(10)

Where q_{SWCNT} is charge developed across SWCNT interface with an oxide layer and C is equivalent capacitance.

The capacitance model includes all the contributing capacitances. There will be induced potential developed across the SWCNT and oxide interface due to the applied gate voltage. Figure 4 illustrates the role of various capacitances in the development of potential across the SWCNT (V_{SWCNT}). The quantum capacitance limit arises in the ballistic limit due to relatively large oxide capacitance [1].

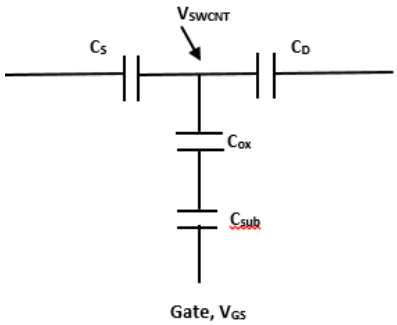


Figure 4. Capacitance model with surface potential V_{SWCNT}

The value of source capacitance Cs and drain capacitance C_D are given as C_s = 0.097C_{ox} and C_D = 0.040C_{ox}. The value of C_{ox} and C_{sub} depends on the dielectric constant value of the material used along with the thickness and radius of carbon nanotube and given as:

$$C_{ox} = \frac{2\pi\epsilon_0\epsilon_{r1}}{ln\frac{t_{ox}+r}{r}} \quad (11)$$

$$C_{sub} = \frac{2\pi\epsilon_0\epsilon_{r2}}{ln\frac{2t_{sub}}{r}} \quad (12)$$

where ϵ_{r1} and ϵ_{r2} are dielectric constant of oxide and substrate material, t_{ox} and t_{sub} are thickness of oxide and substrate, respectively.

The value of q_{SWCNT} is given as:

$$q_{SWCNT} = \frac{e}{2} n_{SWCNT} exp\left(\frac{V_{channel}}{k_B T}\right)\left[1 + exp\left(\frac{-V_{DS}}{k_B T}\right)\right] \quad (13)$$

The calculated values of C_{ox}, C_{sub}, and q_{SWCNT} are multiplied by the SWCNT length for further calculations.

Effective gate bias (V_{eff}) that is to be applied at the gate terminal can be calculated as:

$$V_{eff} = V_{GS} + V_{FB} \quad (14)$$

where V_{FB} is flat-band voltage.

The final step is to calculate drain current [1], which can be calculated as:

$$I_{DS} = \frac{4ek_BT}{h}\sum_p\{ln[1 + exp(\xi_S)] - ln[1 + exp(\xi_D)]\} \quad (15)$$

where h is Plank's constant and the value of S and D is given by:

$$\xi_i = \frac{V_{SWCNT} - \Delta_p + F_i}{k_B T} \qquad i = S, D \quad (16)$$

where F_S and F_D are the fermi level of source and drain. The source Fermi level may be assumed to be a reference potential as $F_S = 0$. The value of F_D will be eV_{DS} (eV) lower than the F_S. It may be written as $F_D = F_S - eV_{DS}$, where e is an electronic charge [1,8].

IV Analytical Results

The analytical model is developed by investigating the electronic structure and corresponding analytical expressions provided in section III. The photo-voltage, the total charge, and the drain-source current of the CNFET PD are calculated for different illuminations (light intensity of 0.02 – 0.2 mW/mm2). The incident light is assumed parallel to the tube axis. The absorption coefficient (α) of (11,0) SWCNTs at the wavelength of 1100 nm is $\approx 5 \times 10^4$ cm $^{-1}$. The calculations are done under DC conditions for various biasing at 3000 K. Various calculations are carried out using the model described in section III and steps obtained in the previous section to represent the system in MATLAB.

To improve the optical absorption with exciton energy scaling, a thinner gate insulator with high dielectric materials such as ZrO_2 and HfO_2 thin films have been employed as the insulator in CNFETs PD. A complete understanding of the surrounding dielectric effects on transition energies in SWCNTs is necessary to understand SWCNTs' optical absorption properties. Therefore, the impact of dielectric screening with different chiral nanotubes are discussed [8,9].

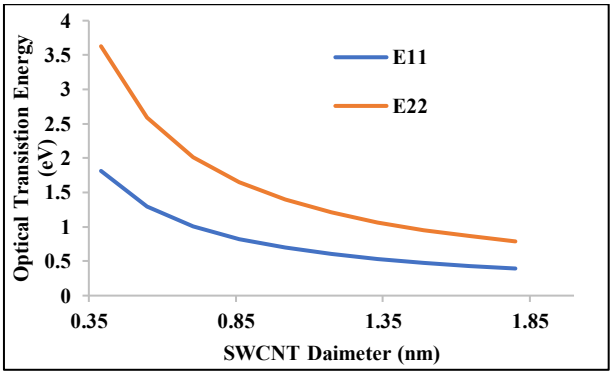


Figure 5. Optical transition energies, E_{11} and E_{22} in s-SWCNT

As seen in figure 5, corresponding optical transition energies to the first two subbands (E_{11} and E_{22}) show a linear dependence with nanotube diameter. Hence, selecting an appropriate chiral nanotube is very important. With the increasing dielectric constant, the energies of both electron-electron and electron-hole interactions decreases, which results in the reduction of the exciton binding energy. Scaling in exciton binding energy causes a shift in the optical transition energy because of the negative energy shown in figure 6.

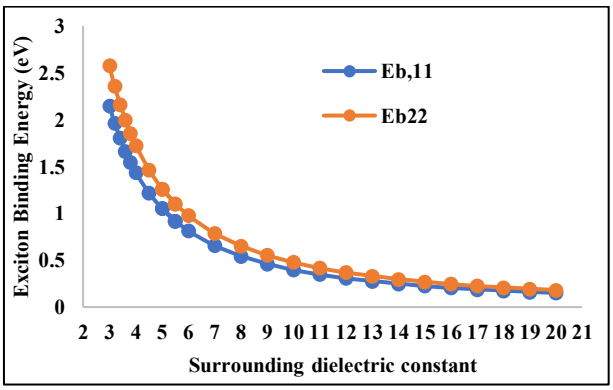


Figure 6. Scaling relationships for excitons binding energy as a function of surrounding dielectric constant

This is since the repulsion energy is larger in magnitude than the exciton binding energy.

The plot in figure 7 shows that with reduced oxide thickness, quantum capacitance increases because of the inverse relationship.

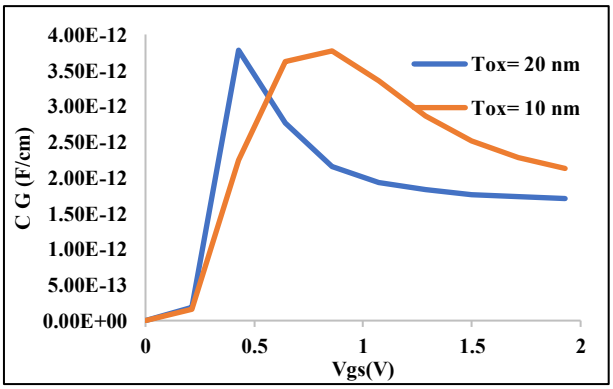


Figure 7. C–V characteristics of circuit compatible capacitance model at different gate oxide thickness

So, it is properly balanced by using high dielectric material in CNFET shown in figure 8 which ultimately leads to decreased leakage, and enhanced performance.

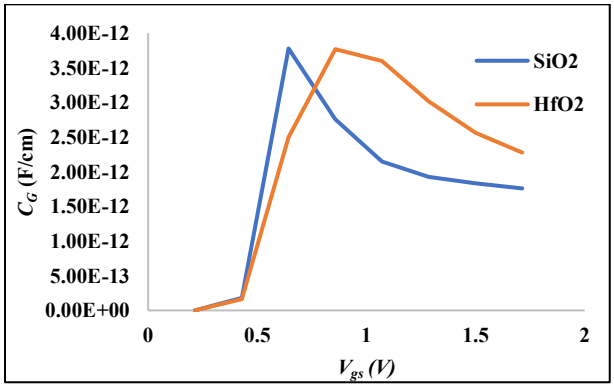


Figure 8. C–V characteristics of circuit compatible capacitance model at different gate dielectric materials

Figure 9 shows the DC output characteristics for different illuminations. It is observed that with an increase in illumination, the drain-source current increases for fixed Vgs.

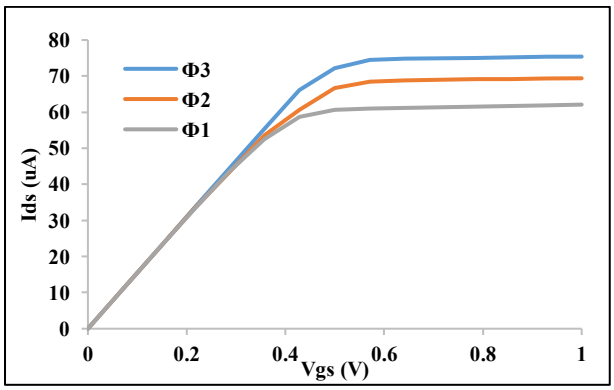


Figure 9. Input DC characteristics curves (I_{ds}–V_{gs}) for different illuminations at V_{ds} = 0.4 V

The photo-voltage at the Schottky contacts increases with the increase in flux density and causes the barrier thinning with an increase in illumination. Hence current increases with the increase in illumination.

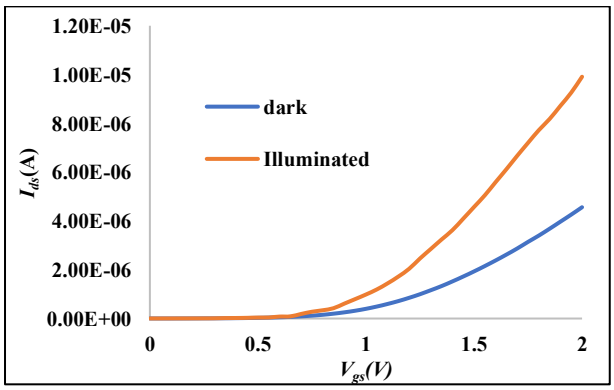


Figure 10. Input DC characteristics curves (I_{ds}–V_{gs}) for different illuminations at V_{ds} = 0.4 V

From figure 10, it is verified that with increasing dielectric constant, the exciton energy can be tuned, so the dissociation rate is increased and so the photogeneration in SWCNTs.

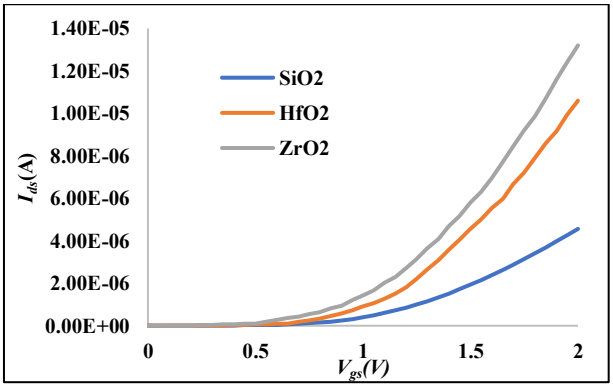


Figure 11. Input DC characteristics curves (I_{ds}–V_{gs}) for different gate oxide materials

Figure 11 shows the DC characteristics under dark and illuminated conditions. It is observed that there is an increase in the drain-source current with the illumination. The current increases because of the photo-voltage at the Schottky contacts.

V. Simulation Results

5.1 CNFET Simulation

2D simulation of CNFET is carried out in Sentaurus TCAD to calculate optoelectrical parameters. There are several physical models available in TCAD software to design semiconductor devices. Simulator makes use of the Poisson's, and drift-diffusion formulation discretized over a multidimensional numerical mesh [8]. The Coupled and Quasistationary commands are used to solve a set of equations and to ramp a solution from one boundary condition to another, respectively. The Coupled command activates a Newton-like solver over a set of equations includes the Poisson equation, continuity, and the different thermal and energy equations [9,10]. With tiny dimensions of CNFET; some quantum modifications are added to the simulation for results to be closer to the real condition [9]. Optical generation is computed using the transfer matrix method (TMM) based on the propagation of plane waves through layered media in CNFET. The use of appropriate model and material parameters is necessary for the simulation of devices in Sentaurus TCAD. Table 2 lists models used for simulation of CNFET phototransistor.

Table 2: Models used for CNFET Simulation [9,10]

Sr. No.	Models	Function
1.	Drift-Diffusion model	Carrier photo generation
2.	Doping Dependent Mobility model	Mobility of Carriers
3.	Shockley-Read-Hall (SRH)	Defect recombination
4.	Transfer Matrix Method (TMM)	Reflection, transmission, and absorption in each layer

5.	Poisson and continuity equations	Current-Voltage characteristics

The parameters tabulated in table 3 are defined for n-SWCNT during CNFET simulation.

Table 3. n-SWCNT Material Parameters [1,3, 4, 6, 8, 10,]

Parameter	Description	Value
ε_r	Relative Permittivity	(10-15)
μ_n(cm^2 /V-s)	Electron mobility	10000
μ_p(cm^2 /V-s)	Hole mobility	10000
χ_0 (eV)	Electron Affinity	4.07
λ_{int} (nm)	Mean free path: Intrinsic SWCNT	200
λ_{doped}(nm)	Mean free path: Doped n-SWCNT	15
$\mathcal{W}$ (eV)	Work function (Al Contact & n-SWCNT)	4.15

In the simulation, the channel length of the CNFET is adjusted at 32 nm to be identical with that of S_i-MOSFET for a fair comparison.

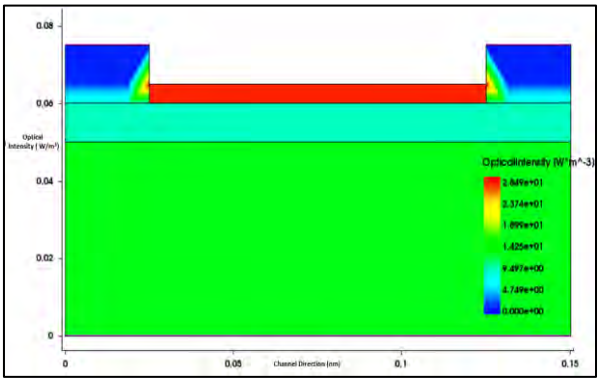


Figure 12. CNFET structure: (sde_dvs.cmd)

Optical generation in CNFET is activated by illuminating from the top using a monochromatic light source whose spectral range varied from 600 nm to 1550 nm. The TMM optical solver requires the use of the complex refractive index model and various excitation variables, all such excitation variables specified in TMM are listed in table 4.

Table 4. Excitation Variables used for Optical Generation [17]

Optical Intensity [W/cm^2]	500
Wavelength [nm]	600 - 1550
Theta [deg]	0 (Normal Incidence)
Polarization Angle [deg]	1 (Unpolarized light)

Figure 13 presents the photocurrent in CNFET at different biasing under dark and illumination.

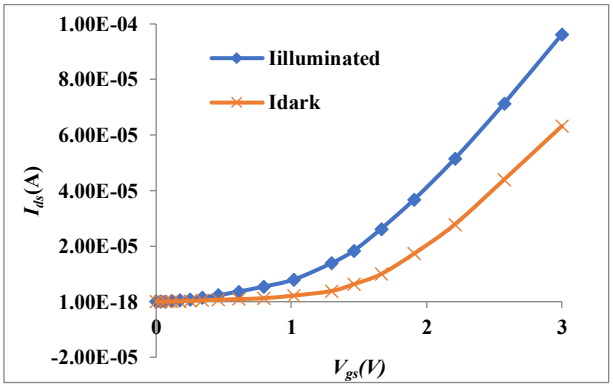


Figure 13. I_{ds}-V_{gs} under dark and illumination. (V_{ds} =0.01 V)

It can be observed that the drain current increases with the illumination. This is because, with the illumination, a forward biasing potential is developed across the SWCNT active layer, which increases the channel potential. Also, the photosensitivity of CNFET is highly dependent on the bias voltage. From the plot, it can be seen that both photocurrent and dark current is increasing with the increasing bias voltage.

5.2 Gate Oxide Dependence

The relatively low dielectric oxide such as SiO_2 brings limitations for its use as a gate oxide in scaled CNFETs due to high leakage current. With high dielectric gate oxides, small thickness deposition is possible and hence allows efficient charge injection into an active channel reducing leakage current. This has further motivated me to explore the integration of high-κ films (~20-30) as gate oxide. The dielectric materials considered for gate oxide during the simulation are listed in table 2. Gate oxide dielectric material-dependent output characteristics of CNFET are shown in figure 14, where the thickness of the gate insulator is kept 50 nm.

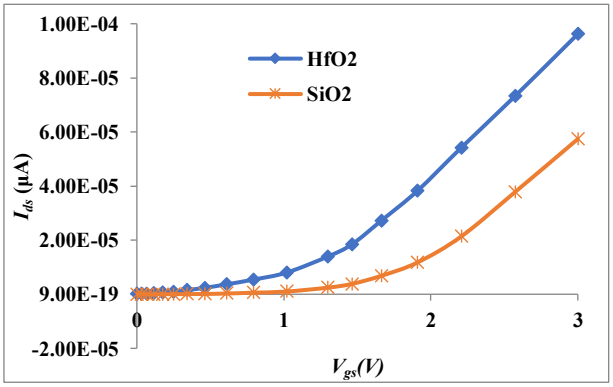


Fig. 14. I_{ds}–V_{gs} curves of CNFET with SiO_2 and HfO_2 gate oxides.

The results are obtained for the ramping gate bias V_{gs} from 0 to 3 V, with drain bias V_{ds} fixed at 0.01 V. For the low dielectric constant of SiO_2 (3.9), the channel current in CNFET is 0.574 μA at V_{gs} = 3V. But with the high dielectric constant, the drain current increases to 0.962 μA. This rise in the drain current is because of high dielectric HfO_2 oxide. Sheikh Ziauddin Ahmed et al. found that with a more than 50 % rise in ON current when HfO_2 is used as the gate dielectric [13]. This

justifies our results obtained by Sentaurus TCAD simulation software.

5.3 Verification and Validation

Table 5 shows the comparative study of the channel current, I_{ds} for the analytical, TCAD simulation model with the experimental data form reference models. It shows that the optically generated current for the model developed is comparable to the reference model.

Table 5: Comparison of I_{ds} for the model developed with [13, 14, 15]

SWCNT Chirality (m, n)	Bandgap E_g (eV)	Gate Oxide material	Gate Oxide Thickness (nm)	Channel Length (nm)	I_{ph} (μA)
(11,0)	1.0	ZrO_2	20	100	6.75*
(11,0)	1.0	ZrO_2	20	100	4.57**
(13,0)	0.85	SiO_2	200	1000	0.53 [14]
(17,0)	0.65	SiO_2	300	1000	0.92 [15]
(19,0)	0.58	SiO_2	200	100	2.90 [13]

*Analytical model
** Simulation Model

VI. Conclusion

Based on the SWCNT optical exciton binding energy scaling relations with the tube's radius and surrounding dielectric constant ε, for the exciton and optical transition energies, the absorption properties of s-SWCNTs are studied. The analytical model shows that exciton energy, E_{11}, and E_{22} optical transition energy, and quantum capacitance decreases with increasing surrounding dielectric oxide strength. I –V and C–V characteristics have been modeled to analyze the effect of dielectric constants and oxide thickness on quantum capacitance. Reduced quantum capacitance outcomes in improved reduced leakage current, which improves the performance of the device. TCAD simulation model of CNFET shows an improvement in photocurrent at scaled exciton energy

The use of high dielectric oxide material shows exciton energy scaling and improvement in CNFET optical absorption. The role of an external electric field can also be accounted for in this study to scale of exciton energy further, which could lead to performance enhancements of CNFET photodetector.

References

[1] Amandeep Singh, *et al.*," Modeling and simulation of carbon nanotube field-effect transistor and its circuit application", © 2016 Chinese Institute of Electronics, Journal of Semiconductors, Volume 37, Number 7.

[2] ITRS Roadmap, 2009, available online at <http://www.itrs.net>.

[3] J. Robertson, "High dielectric constant oxides ",Eur. Phys. J. Appl. Phys. Volume 28, Number 3, 265-291, December 2004.

[4] Md. Shamim Sarker, *et al.*, "Gate dielectric strength dependent performance of CNT MOSFET and CNT TFET: A tight-binding study", ELSEVIER, Results in Physics 6 (2016) 879–883.

[5] Ali Javey, *et al.*, "Carbon Nanotube Field-Effect Transistors with Integrated Ohmic Contacts and High-K Gate Dielectrics", Nano Letters, 2004, 4 (3), pp 447–450.

[6] Yi-Ruei Jhan, " 3D TCAD Simulation for CMOS Nanoeletronic Devices ",© Springer Nature Singapore Pvt Ltd. 2018.

[7] Javey A, et al. ,"Carbon nanotube field-ffect transistors with integrated ohmic contacts and high-k gate dielectrics" , Nano Lett, 2004, 4(3): 447.

[8] François Léonard.," The Physics of Carbon Nanotube Devices.", William Andrew, Norwich, NY, USA, 2008.

[9] Sentaurus User Guide, Version G-2012.06, June 2012, SYNOPSIS ®

[10] Wind S J, Appenzeller J, Avouris Ph.," Lateral scaling in carbonnanotube field-effect transistors",. Phys Rev Lett, 2003, 91(5):058301.

[11] Dresselhaus M S, Dresselhaus G, Saito R. ,"Physics of carbon nanotubes. ',Carbon, Vol. 33, No. 7, pp. 883-891, 1995.

[12] Mintmire J W, White C T. , 'Universal density of states for carbon nanotubes., ' Phys Rev Lett, 1998, 81(12): 2506.

[13] Sheikh Ziauddin Ahmed, *et. al.*," Current-Voltage Characteristics of Ballistic Schottky Barrier GNRFET and CNTFET: Effect of Relative Dielectric Constant", Nano/Micro Engineered and Molecular Systems(IEEE NEMS 2015) X'ian, China , April 7-11, 2015.

[14] Png Ching Eng, Sun Song, and Bai Ping, "State-of-the-art photodetectors for optoelectronic integration at telecommunication wavelength," Review Article, Nanophotonics 2015; 4:277–302.

[15] Park et al, "Significant Enhancement of Infrared Photodetector Sensitivity Using a Semiconducting Single‐Walled Carbon Nanotube/C60 Phototransistor," Advanced Materials. 2015, 27, 759.

This page is kept blank intentionally

Enhancement of Power Conversion Efficiency with Optimization of Device Dimensions and Doping

Sukruti Kaulgud
Research Scholar, Assistant professor
Department of Electronics and Telecommunication
Thakur College of Engg. & Technology
Mumbai, India
sukruti.kaulgud@thakureducation.org

B. K. Mishra
Principal
Thakur College of Engg. & Technology
Mumbai, India
tcet.principal@thakureducation.org

Abstract- **In wireless sensor network, (WSN) energy constraint is a biggest challenge where solar cell is the most preferred option for energy harvesting. Graphene promises to be an effective solar cell material. However, the power conversion efficiency of a solar cell using Graphene as one of the electrodes is not meeting expectations. This work is aimed to develop a simulation model of Metal-Insulator Semiconductor (MIS) solar cell to improve power conversion efficiency. The optimum thickness of interfacial layer is 1.5nm and the Graphene layer is 5nm. The optimization of an oxide layer thickness and Graphene layer thickness enhances power conversion efficiency from 1.9% to 5.32%. P-type doping of graphene by HNO_3 treatment increases its work function. 100HNO_3 doping further enhances the PCE to 11.85%. These cells are flexible, easy to fabricate and it also has the advantage of large-scale production and cost-effectiveness.**

Keywords-Doping, Graphene, Interfacial Layer, MIS solar cell, Passivation, Power Conversion Efficiency.

I. INTRODUCTION

Si solar cells require complicated processes for junction formation like high temperature diffusion and ion implantation. The crystalline silicon solar cells are manufactured with energy and time intensive processes while amorphous silicon shows a promise for cheap solar cells particularly with thin film technology [1]. As alternative materials, two-dimensional (2D) carbon nanomaterials i.e. graphene and carbon nanotube (CNT), based solar cells have received enormous interest from research perspective. Zhongrui Li et al. [2] have fabricated the solar cell devices with graphene to create high-density p–n heterojunctions. The high aspect ratios and large surface area of Graphene improve carrier transport thus improving the power conversion efficiency. Debayan Sarkar et. al [3] have developed a Building Integrated Photovoltaic (BIPV) system to increase maximum power generation and reduce the overall cost. X. Li et al. [4] have fabricated a MIS solar cell with Graphene and Silicon as two electrodes, which shows short circuit current density as 4 − 6.5 mA/cm2, open circuit voltage as 0.42 − 0.48 V, fill factor as 45 − 56% and efficiency as 1.0 − 1.7 %. Still optimum thickness of Interfacial layer is needed to improve Power Conversion Efficiency. Xiao chang Miao et al. have used monolayer graphene and silicon as p-type and n-type electrodes respectively to fabricate a solar cell with Schottky junction. This gives a power conversion efficiency of 8.6% with AM1.5 illumination [4]. The optimum thickness of the Graphene layer needs to be addressed. Graphene is a zero-bandgap semiconductor so to use Graphene in device application it is required to induce a bandgap. To adjust the work function of graphene chemical doping (HNO_3, $AuCl_3$, thionylchloride ($SOCl_2$)), shows efficient processes which reduces its resistance [5]. Xinming Li et al. have verified that for improving the Schottky junction in the solar cell, having the p-type chemical doping can be beneficial. The efficiency increased from 5.53% to 9.2% [6]. At the same time effect of concentration of HNO_3 doping on the device performance need to be studied. However, the combined effect of interfacial layer of optimum thickness, Graphene layer of optimum thickness and optimum HNO_3 doping on the Silicon-Graphene MIS solar cell need to be addressed. Till date, a number of research work related to the MIS solar cells are reported in the literature [6-11]. But none of them explores the use of TCAD based modelling. Therefore, this work concentrates on TCAD simulation of Graphene-Silicon solar cell. Most of the reported research work on TCAD simulation of solar cell is done using Silvaco TCAD. This work is unique as it uses Sentaurus TCAD where a simulation model has been developed for a Graphene-SiO_2-Si(N) based MIS solar cell. The intent of this investigation is to find optimum thickness of Interfacial layer, Optimum thickness of Graphene layer and optimum concentration of HNO_3 doping. The model also investigates the effect of these parameters on the device PCE.

II. DEVICE STRUCTURE:

The function of insulating layer is to suppress the recombination of majority carriers with minority carriers. As interfacial layer thickness increases, recombination increases which in turn dominates the tunneling effect, resulting in reduced fill factor. Hence, the thickness of the interfacial layers should be

meticulously calculated. The Graphene-oxide layer-Si(N) based MIS solar cell model is schematically shown in Fig. 1.

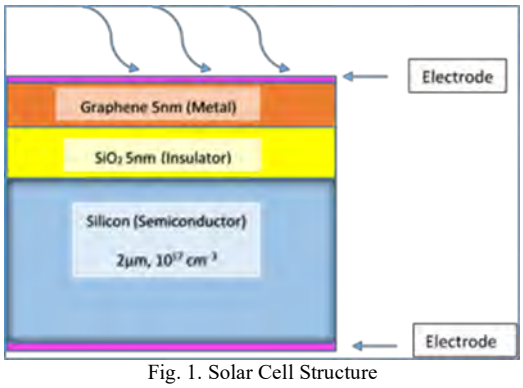


Fig. 1. Solar Cell Structure

In this structure, the Graphene is used as the metal electrode. A very thin SiO_2 layer acts as a passivating layer and n-type doped Silicon acts as the absorption layer. The graphene layer is doped with HNO_3 to vary the work function. In this device structure optimum thickness of Oxide layer and Graphene layer is considered. The thicknesses of n type Silicon and front electrode are assigned 2μm and 1nm respectively. The donor concentration of $10^{17}cm^{-3}$ is considered for Silicon. The sheet density of $10^{-12}cm^{-2}$ is used for Graphene [11].

III. WORKING OF DEVICE:

A. Effect of Oxide Layer Thickness

Since Graphene has no band-gap and high conductivity properties [12], the Graphene-Silicon (N) heterojunction is a metal-semiconductor Schottky junction. However, Schottky junction solar cells have the problem of lower open circuit voltage (*Voc*). The barrier height ψ_b is increased by inserting a thin layer of insulator between the metal and the semiconductor layers. Minority carriers are tunnelled through the thin insulating layer like Silicon dioxide that reduces the recombination rate of electron-hole pair. It also reduces dark current. As the thickness of interfacial layer (usually an oxide) increases, it provides higher barrier to tunnelling. Due to this effect the saturation current reduces, and consequently, *Voc* increases.

$$\psi_b - \psi_m = \chi \qquad (1)$$

Where the electron affinity of semiconductor is denoted by χ, ψ_m is the work function of Graphene and the barrier height for n-type semiconductor is denoted by ψ_b, [13]. From Fig. 2 it is evident that when there is no interfacial oxide, the barrier height is too small for the electrons to cross the junction from Silicon to Graphene. But when Interfacial layer is introduced, the barrier height increases. Now it is difficult for the electrons to cross over the junction. This interfacial layer acts as electron blocking layer. The density of the interface states (Dss) and the oxide thickness (δ) strongly influences the height of the Schottky barrier in the MIS solar cells [14].

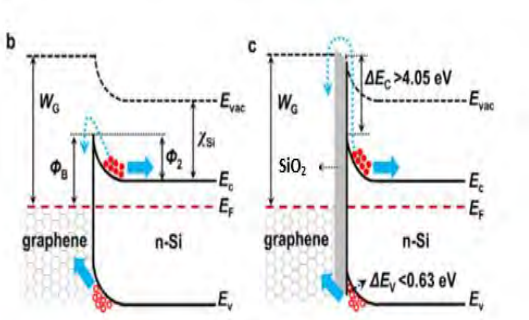


Fig. 2. Charge Separation [12]

B. Effect of HNO_3 Doping

Chemically doping the graphene opens the bandgap in the graphene which enhances the absorption of light. The proposed solar cell is doped with HNO_3 solutions with different concentrations of 20%, 50%, 70% and 100%, which are addressed as $20HNO_3$, $50HNO_3$, $70HNO_3$ and $100HNO_3$ respectively. The nitric acid increases the carrier concentration of holes and reduces the sheet resistance. This can be shown according to the reaction [13].

$$6HNO_3 + 25C \rightarrow C25^{+}No_3{}^{*}\ 4HNO_3 + No_2 + H_2O \qquad (2)$$

Due to this, there is a shift of the Fermi level which results in increased conductivity and the carrier concentration of the graphene layers. Due to HNO_3 treatment there is p-doping in Graphene which increases the work function of graphene. Increasing the work function of graphene film gives the advantage of a larger built in voltage which results in a larger *Voc*. The sheet resistance of graphene films can be decreased with chemical treatment. The enhancement of the Schottky junction quality and the decrease of Rs improves *FF*.

C. Solar Cell Efficiency

The performance parameters of a MIS solar cell include the short circuit current density (*Jsc*), the open circuit voltage (*Voc*), the fill factor (*FF*) and the conversion efficiency (η). All these parameters can be defined as [15]

$$V_{oc} = n\left[\varphi_{bn} + \frac{kT}{q}\sqrt{\chi\delta} + \frac{kT}{q} log\left(\frac{Jsc}{A*T^2}\right)\right] \qquad (3)$$

$$FF = \frac{V_m I_m}{V_{oc} J_{sc}} \qquad (4)$$

$$\eta = \frac{V_{oc} I_{sc} FF}{P_{inc}} \qquad (5)$$

where, P_{inc} is the incident optical power and V_m, I_m correspond to the cell voltage and to the cell current respectively under maximum power condition.

IV. TCAD SIMULATION

A. What is TCAD

The most advanced tool amongst all is the Sentaurus TCAD software. Hence, in this research work Sentaurus TCAD is chosen to simulate complex Graphene-Silicon solar cell structure. Since Sentaurus TCAD is basically used to design physical models which describe

semiconductor material properties and solve semiconductor equations, it can be used for the simulation of Graphene-Silicon devices.

B. Defining Graphene

While the Si and SiO_2 material parameters are readily available within Sentaurus, it is necessary to create a model for Graphene based on literature values. Since Graphene is acting as metal its bandgap is assumed to be zero. Table I lists the parameter values considered to define Graphene.

TABLE I. GRAPHENE PARAMETERS [12]

Sr. No.	Parameter	Value
1.	Work Function	4.5
2.	Epsilon	6.9
3.	Complex Refractive Index	2.5
4.	Thermal Conductivity	2000w/mk
5.	Effective Mass	0.35
6.	Nc and Nv	1
7.	Constant mobility	10^6 cm^2/mk
8.	Interatomic Distance	0.142nm

C. Device Physics

As the solar spectrum a polychromatic light Air Mass 1.5 global (AM 1.5G) is used. Carrier photogeneration is modelled by the transfer matrix method (TMM). For carrier transport the drift-diffusion model is used. An ideal ohmic contact is assumed with Charge neutrality and equilibrium for metal contacts [17]:

$$n_0\text{-}p_0 = N_D\text{-}N_A \quad (6)$$

$$n_0\text{–}p_0 = n_{2i,eff} \quad (7)$$

where n_0 and p_0 are the electron and hole equilibrium concentrations.

Masetti model is used to consider doping dependent mobility model which is material dependent by default [17].

$$\frac{\partial \hat{E}}{\partial x} = \frac{\rho}{\varepsilon} = p + N_D^+ - n - N_A^- \quad (11)$$

$$\frac{\partial n}{\partial t} = \frac{1}{q}\frac{\partial J_n}{\partial x} + G_n - U_n, \quad \frac{\partial p}{\partial t} = \frac{1}{q}\frac{\partial J_p}{\partial x} + G_p - U_p \quad (12)$$

At the interfaces of the device the drift and diffusion model is used. The electron current density and hole current density for drift-diffusion model are given by [17]:

$$J_n = \mu_n(n\nabla E_c - 1.5nKT\nabla lnm_n) + D_n(\nabla n - n\nabla ln\gamma_n) \quad (13)$$

$$J_p = \mu_p(p\nabla E_v - 1.5pKT\nabla lnm_p) + D_p(\nabla p - p\nabla ln\gamma_p) \quad (14)$$

Finally, the performance parameters of a MIS solar cell are calculated using equations (3), (4) and (5).

D. HNO_3 Doping

To get doping of Graphene with Nitric acid effect in simulation, material parameters need to be varied. The proposed solar cell is doped with HNO_3 solutions with different concentrations of 20%, 50%, 70% and 100%,

$$\mu_{dop} = \mu_{min1}exp\left(\frac{P_c}{N_{A,0}+N_{D,0}}\right) + \frac{\mu_{const}-\mu_{min2}}{1+\left(\frac{(N_{A,0}+N_{D,0})}{C_r}\right)^{\alpha}} - \frac{\mu_1}{1+\left(\frac{C_s}{(N_{A,0}+N_{D,0})}\right)^{\beta}} \quad (8)$$

Shockley-Read-Hall (SRH) model is used to consider defect recombination at the bulk and at the surface. In Sentaurus Device, the following form is implemented [17]:

$$R_{net}^{SRH} = \frac{np - n_{i,eff}^2}{\tau_p(n + n_1) + \tau_n(p + p_1)} \quad (9)$$

The transfer matrix method (TMM) is used to calculate the optical parameters like reflection, transmission and absorption of the structure. The majority charge carriers, electrons, tunnels through the small barrier present at the interface. To consider this phenomenon a direct tunneling model is used. The transport of charge carriers across barrier is accounted by the direct tunneling and thermionic emission.

The electron tunneling current density is [17]:

$$J_n = \frac{qm_c k}{2\pi^2\hbar^3}\int_0^{\infty} dE\gamma(E)\left\{T(0)\ln\left(exp\left[\frac{E_{F,n}(0) - E_c(0) - E}{kT(0)}\right] + 1\right) - T(d)\ln\left(exp\left[\frac{E_{F,n}(d) - E_c(0) - E}{kT(d)}\right] + 1\right)\right\} \quad (10)$$

Where, the effective thickness of the barrier is denoted by d, a mass prefactor is denoted by mc, the one (the 'substrate') side of the barrier is denoted by argument 0 and the other side by d, and the energy is denoted by *E*. To obtain current-voltage characteristics, at all points of the 2D mesh, the Poisson and continuity equations are solved [17].

which are addressed as $20HNO_3$, $50HNO_3$, $70HNO_3$ and $100HNO_3$ respectively. Table II presents the variation in work function of pristine graphene and variation in work function of HNO_3 modified graphene. Table II also presents the changes in sheet resistance of Graphene after HNO_3 treatment:

TABLE II: WORK FUNCTION AND SHEET RESISTANCE VARIATION WITH HNO_3 CONCENTRATION

Sr. No.	Concentration of HNO_3	Work Function of Graphene [17]	Sheet Resistance of Graphene [18,19]
1.	Pristine Graphene	4.5	800
2.	$20HNO_3$	4.68	720
3.	$50\ HNO_3$	4.81	650
4.	$70\ HNO_3$	5.21	580
5.	$100\ HNO_3$	5.31	500

The materials file of Graphene is modified for work function and sheet resistance as per the given table.

V. RESULTS

A. Effect of Oxide Layer Thickness

The open circuit voltage of the devise can be improved by altering the thickness of the native oxide in the solar cell. Here the oxide thickness is varied from 0.5nm to 2.5nm. Fig. 3(a) shows that as the oxide layer thickness increases from 0.5nm to 2.5nm, there is increase in open circuit voltage. From Fig. 3(b) it is evident that from oxide thickness 0.5nm to 1.5nm the *Jsc* increases, but as the oxide thickness increases there is slight decrease in *Jsc*. Fig. 3(c) shows reduction in fill factor after oxide thickness 1.5nm. As there is significant decrease in Fill Factor and *Jsc* for oxide thickness more than 1.5nm, power conversion efficiency also decreases beyond that. Therefore 1.5nm is the optimum oxide thickness for the designed solar cell.

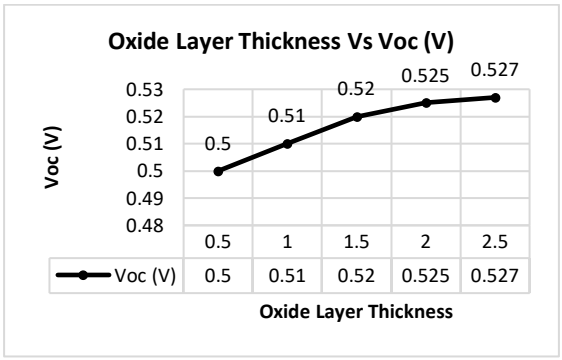


Fig. 3. (a)Oxide Layer Thickness Vs *Voc*

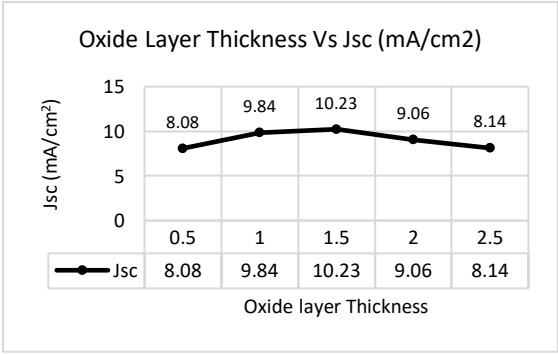


Fig. 3. (b)Oxide Layer Thickness Vs *Jsc*

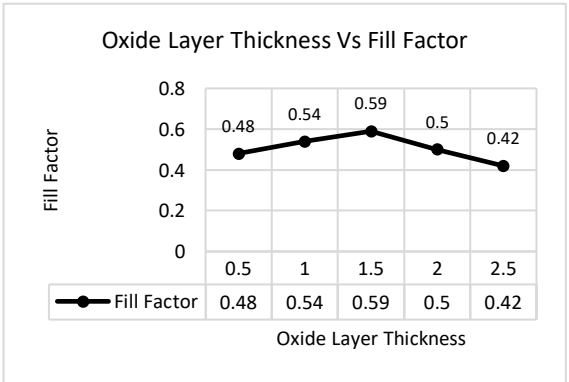


Fig. 3. (c)Oxide Layer Thickness Vs Fill Factor

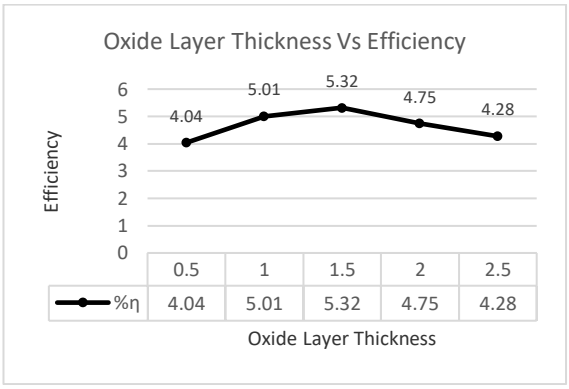


Fig. 3. (d)Oxide Layer Thickness Vs Efficiency

Table III shows the variation in *Jsc*, *Voc*, *FF* and *PCE* with varying interfacial layer thickness.

TABLE III. EFFECT OF OXIDE LAYER THICKNESS

Thickness of SiO_2 (nm)	*Jsc* (mA/cm^2)	*Voc* (V)	Fill Factor	%*η*
0.5	8.08	0.5	0.48	4.04
1	9.84	0.51	0.54	5.01
1.5	10.23	0.52	0.59	5.32
2	9.06	0.525	0.5	4.75
2.5	8.14	0.527	0.42	4.28

From these curves, it can be inferred that as the interfacial layer thickness increases, *Voc* increases. For the device with oxide layer thickness of 0.5nm, the average *Voc* was 0.5V and the average PCE was 4.04%. For the device with 1.5 nm oxide, *Voc* improves to 0.52 V. It enhances the average PCE to 5.32% (Fig. 3(d)). But, as the oxide thickness increases further, tunneling effect reduces which in turn reduces the PCE.

B. Effect of Graphene Layer Thickness

The value of *Voc* increases when increasing the number of layers of graphene (Fig. 4(a)).

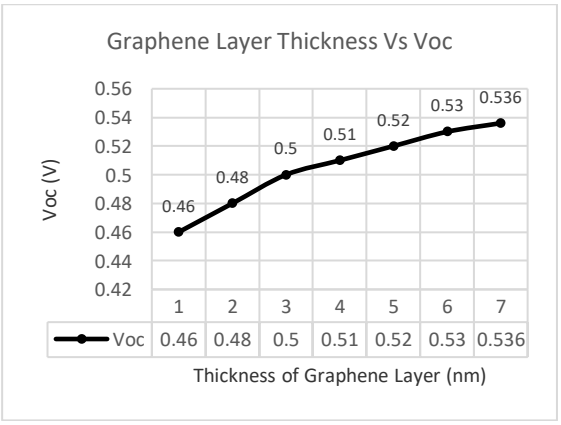


Fig. 4. (a)Graphene Layer Thickness Vs *Voc*

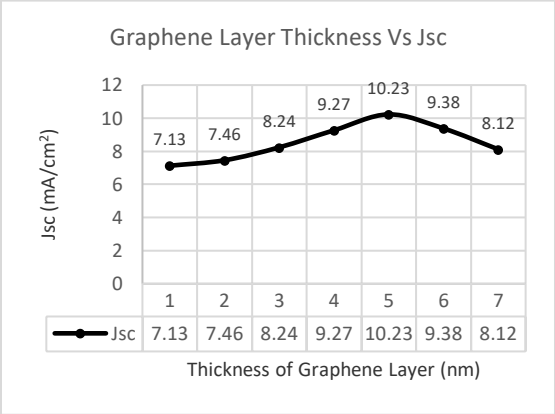


Fig. 4. (b)Graphene Layer Thickness Vs *Jsc*

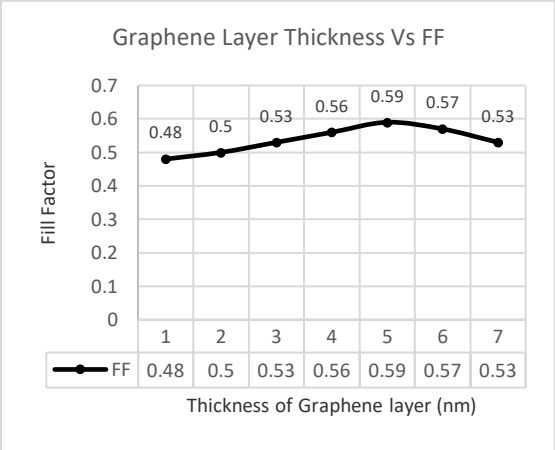


Fig. 4. (c)Graphene Layer Thickness Vs Fill Factor

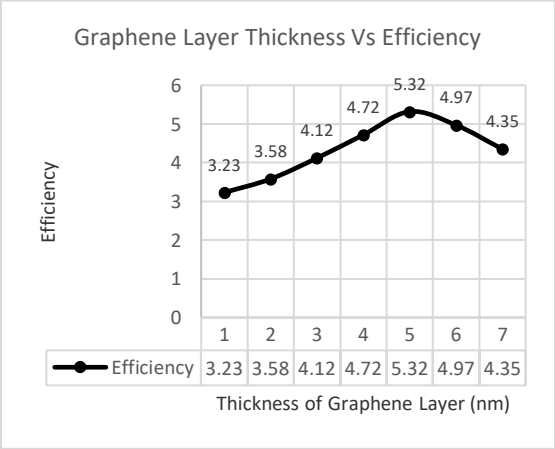


Fig. 4. (d)Graphene Layer Thickness Vs Efficiency

However, *Jsc* increases when the graphene layers are less than 4 but decrease on adding any more layer (Fig. 4(b)). As the thickness of the Graphene layer increases the sheet resistance decreases but at the same time the transparency of Graphene layer decreases which in turn decreases the Fill Factor (Fig. 4(c)). For Graphene layer thickness upto 5nm, there is increase in *Voc*, *Jsc* and *FF* and hence there is increase in PCE. But for the Graphene layer thickness above 5nm, *Jsc* and *FF* decreases and hence there is decrease in PCE. Hence it is observed that the optimum thickness of Graphene layer is 5nm (Fig. 4(d)). Table 4 shows the variation in *Jsc*, *Voc*, *FF* and PCE with varying Graphene layer thickness.

TABLE IV. EFFECT OF GRAPHENE LAYER THICKNESS

Thickness of Graphene Layer (nm)	***Jsc* (mA/cm²)**	***Voc* (V)**	**Fill Factor**	**%*η***
1	7.13	0.46	0.48	3.23
2	7.46	0.48	0.5	3.58
3	8.24	0.5	0.53	4.12
4	9.27	0.51	0.56	4.72
5	10.23	0.52	0.59	5.32
6	9.38	0.53	0.57	4.97
7	8.12	0.536	0.53	4.35

From the Table IV it is evident that the optimum thickness of 5nm (4 layers) of graphene layer is most suitable to fabricate highly efficient Schottky junction solar cells. PCE of 5nm graphene solar cells can be enhanced by chemical doping as it reduces the solar cell series resistance and the graphene sheet resistance. This result is also consistent with the results found in the literature [10].

TABLE V. COMPARATIVE STUDY OF EFFECT OF GRAPHENE LAYER THICKNESS

Silicon Thickness	**Interfacial Layer**	**Thickness of Graphene layer**	***Jsc* (mA/cm²)**	***Voc* (V)**	**%*η***
2 µm	SiO_2 (1.5 nm)	5 nm	10.23	0.52	5.32
2 µm	h-BN (few layers)	10nm	10.16	0.474	4.4 [18]
2 µm	SiO_2 window	10 nm	10.44	0.14	1.9 [20]
5 µm	SiO_2 window	10nm	6.5	0.48	1.7 [7]

In Table V the efficiency obtained in this work is compared with efficiency obtained in the past with similar device design.

C. Effect of Interfacial Oxide

Fig. 5 compares the curves of current-voltage relation (*Voc* vs. *Jsc*) for a Graphene/n-Si based Schottky junction solar cell and Graphene-SiO_2-Si based MIS solar cell. In this figure *Jsc*(No Interfacial Oxide) refers to the current density for the device without interfacial layer, *Jsc*(5nm) refers to the current density for the device with interfacial layer of thickness 5nm and *Jsc*(1.5nm) refers to the current density for the device with interfacial layer of thickness 1.5nm. From this figure, it is evident that the open circuit voltage of the MIS solar cell with only a 5 nm thick oxide layer is significantly higher than that of Schottky junction solar cell. It is also evident that the *Voc* for a solar cell with 1.5nm oxide layer is higher than the *Voc* for solar cell with 5nm thick oxide layer. The results show that the optimum thickness of oxide layer for the designed solar cell is 1.5nm.

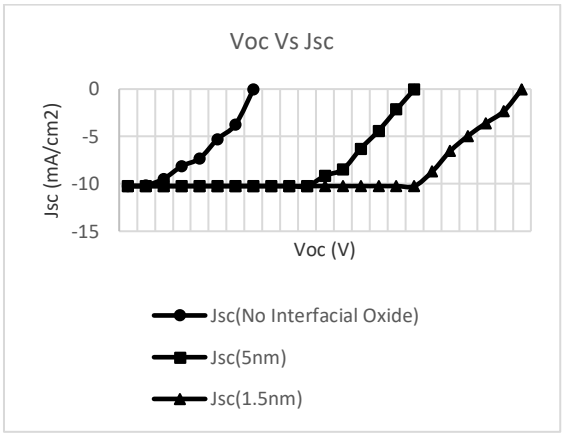


Fig. 5. Current Density Vs Open Circuit Voltage for solar cell without interfacial Oxide and with interfacial oxide

D. Effect of HNO_3 Doping Concentration

Due to HNO_3 treatment there is p-doping in Graphene which increases the work function of graphene. Owing to HNO_3 doping, Fermi level of graphene is lowered from the Dirac point due to increase in the hole concentration. It results in reduction of recombination losses [17]. Increased work function of Graphene increases the height of the barrier. A high *Voc* is obtained due to a large barrier.

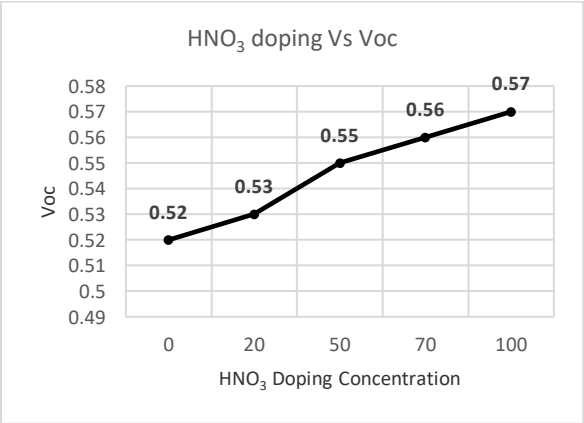


Fig. 6. (a) HNO_3 Doping Vs *Voc*

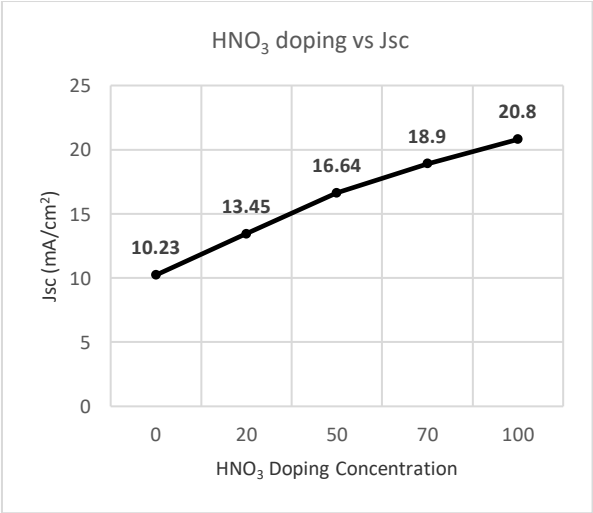


Fig. 6. (b) HNO_3 Doping Vs *Jsc*

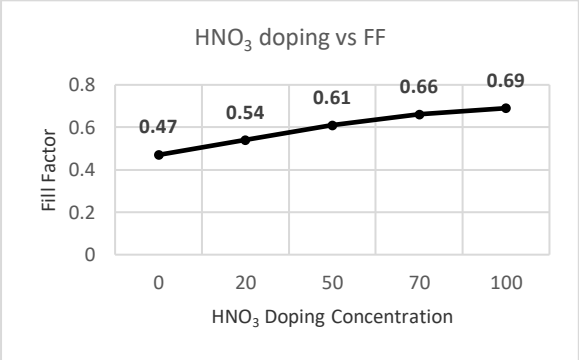


Fig. 6. (c) HNO_3 Doping Vs *FF*

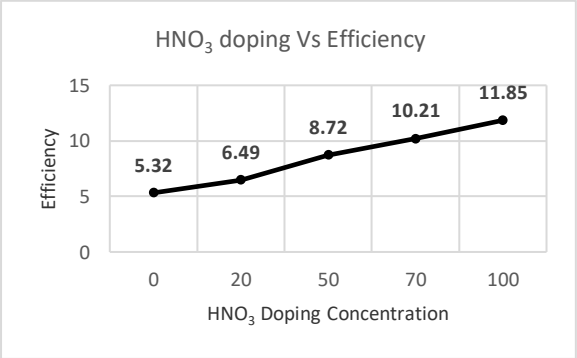


Fig. 6. (d) HNO_3 Doping Vs Efficiency

From Fig. 6(a) it is evident that with HNO_3 doping, work function of Graphene enhances. It increases the open circuit voltage. It can be seen that at $100HNO_3$ the Voc is 0.57. HNO_3 doping has less effect on Jsc (Fig. 6(b)). With HNO_3 doping, the carrier concentration in Graphene increases. It reduces the sheet resistance. The diode ideality factor improves. This improves the quality of the schottkey junction. These effects enhance the fill factor of the solar cell (Fig. 6(c)). It is observed that the fill factor at $100HNO_3$ is 0.69. As the *Voc* and fill factor increases the PCE increases from 5.32% to 11.85% (Fig. 6(d)).

TABLE VI. HNO_3 DOPING

Silicon Thickness	Thickness of SiO_2	Thickness of Graphene layer	*Jsc* (mA/cm^2)	*Voc* (V)	Fill Factor	%η
2 µm	1.5 nm	5nm (4 layers)	20.8	0.57	0.69	11.85
2 µm	SiO_2 window	8nm (7 layers)	17.06	0.55	0.69	9.27 [21]
2 µm	SiO_2 window	4nm (3 layers)	14.53	0.52	0.61	4.71 [5]

Above Table VI shows the comparison of the observed result with literature [21] and [5].

VI. CONCLUSION

This work develops a sophisticated analytical model for a Graphene-based MIS solar cell. It simulates the Graphene-SiO_2-Silicon MIS solar cell using Sentaurus TCAD. This work meticulously investigates the role of interfacial layer for the carrier management at the interface of Silicon and Graphene. The intent of this

investigation is to find the optimum thickness of interfacial layer and Graphene layer and to observe its effect on *Voc*, *Jsc*, *FF* and Efficiency.

By applying optimization of interfacial layer thickness and Graphene layer thickness, the PCE is increased from 1.9% to 5.32%. As the oxide thickness increases further a decrease in power conversion efficiency is observed.

Compared to pristine graphene electrodes, the device consisting of HNO_3 doped graphene electrodes displayed high PCE. It is observed that with $100HNO_3$ doping the power conversion efficiency increases to 11.85%.

These solar cells possess characteristics such as low temperature processing, higher flexibility and stability. It also provides the advantage of low-cost fabrication technology, which is suitable for production on large scale for industrial applications.

The efficiency can be further improved by various means. The antireflection effect improves light absorption by Si and leads to higher PCE. The recombination can be reduced by inserting a thin P3HT or TIPs-pentacene organic layer. The insertion of organic layer, optimum graphene doping level and optimum thickness of graphene layer can improve the performance of solar cells.

ACKNOWLEDGEMENTS

This work was supported by Indian Nanoelectronics Users' Program (INUP) which is funded by Ministry of Electronics and Information Technology (MeitY - Gov. of India) at Indian Institute of Technology Bombay, Mumbai, India – 400076. Authors acknowledge the facilities and guidance extended to use Sentaurus TCAD simulation.

DECLARATION OF INTEREST

Authors declare that there are no known conflicts of interest associated with this publication.

REFERENCES

[1] S C Bajpai, R C Gupta, "Present Status of Silicon Solar Cells and Photovoltaic Power Systems", *J. IETE Tech. Review*, Vol. 7, pp. 344-353, Jun. 2015

[2] Zhongrui Li, Liqiu Zheng, Viney Saini, Shawn Bourdo, Enkeleda Dervishi & Alexandru S. Biris, "Solar cells with graphene and carbon nanotubes on silicon", *J. of Exper. Nanosci.*, Vol. 8, No. 4, pp. 565-572, Jan. 2013.

[3] Debayan Sarkar, Anand Kumar & Pradip Kumar Sadhu, "A Survey on Development and Recent Trends of Renewable Energy Generation from BIPV Systems", *J. IETE Tech. Review*, Apr. 2019

[4] X. Li, H. Zhu, K. Wang, A. Cao, J. Wei, C. Li, Y. Jia, Z. Li, X. Li and D. Wu, "Graphene-On-Silicon Schottky Junction Solar Cells", *Adv. Materials*, Vol. 22, no. 25, pp. 2743-2748, Apr. 2010.

[5] X. Miao, S. Tongay, M. Petterson, K. Berke, A. Rinzler, B. Appleton and A. Hebard, "High Efficiency Graphene Solar Cells by Chemical Doping", *Nano Lett*., Vol. 12, no. 6, pp. 2745-2750, May. 2012.

[6] Tong xiang Cui, Ruitao Lv, Zheng-Hong Huang, Shuxiao Chen, Zexia Zhang, Xin Gan, Yi Jia, Xinming Li, Kunlin Wang, Dehai Wua and Feiyu Kang, "Enhanced efficiency of graphene/silicon heterojunction solar cells by molecular doping", *J. of Mater. Chem. A*, Vol. 1, pp. 5736-5740, Feb. 2013.

[7] Xinming Li, Dan Xie, Hyesung Park, Miao Zhu, Tingying Helen Zeng, Kunlin Wang, Jinquan Wei, Dehai Wu, Jing Kong and Hongwei Zhu, "Ion doping of graphene for high-efficiency heterojunction solar cells", *The Royal Soci. of Chem*., Vol. 5, pp. 1945-1948, Jan. 2013.

[8] Yi Song, Xinming Li, Charles Mackin, Xu Zhang, Wenjing Fang, Tomas Palacios, Hongwei Zhu and Jing Kong, "Role of Interfacial Oxide in High-Efficiency Graphene−Silicon Schottky Barrier Solar Cells", *Nano Lett.,* Vol. 15, pp. 2104-2110, Feb. 2015.

[9] Y. An, A. Behnam, E. Pop, G. Bosman, A. Ural, "Forward-bias diode parameters, electronic noise, and photoresponse of graphene/silicon Schottky junctions with an interfacial native oxide layer", *J. Appl. Phys.,* Vol. 118, pp 114307-114314, Sept. 2015.

[10] Y. Kuang, D. Zhang, Y. Ma, Y. Liu, Z. Shao, X. Hong, X. Yang and J. Feng, "Effect of near surface inverse doping on Graphene Silicon heterojunction solar cell", *Opti. and Quant. Electr.*, Vol. 48, no. 3, pp. 199(1-9), Mar. 2016.

[11] Y. Li, W. Yang, Z. Tu, Z. Liu, F. Yang, L. Zhang and R. Hatakeyama, "Schottky junction solar cells based on Graphene with different numbers of layers", *Appl. Phy. Lett*., Vol. 104, no. 4, pp. 043903(1-4), Jan. 2014.

[12] P. Avouris, "Graphene: Electronic and Photonic Properties and Devices", *Nano Lett.*, Vol. 10, no. 11, pp. 4285-4294, Sept. 2010.

[13] Jun-Hua Meng, Xin Liu, Xing-Wang Zhang, Yue Zhang, Hao-Lin Wang, Zhi-Gang Yin, Yong-Zhe Zhang, Heng Liu, Jing-Bi You, Hui Yan, "Interface engineering for highly efficient graphene-on-silicon Schottky junction solar cells by introducing a hexagonal boron nitride interlayer", *Nano Ener*., Vol. 28, pp 44-50, Oct. 2016.

[14] Yawei Kuang, Yushen Liu, Yulong Ma, Jing Xu, Xifeng Yang, Jinfu Feng, "TCAD analysis of Graphene Silicon Schottky junction solar cell", Intern. Symp. on Photo. and Optoelectr., *Proc. of SPIE*, Vol. 9656, 96560W, pp 1-6, Aug. 2015.

[15] Muhammad Johirul Islam, Md. Mahmudul Hasan, Rifat Sami and Md.Iqbal Bahar Chowdhury, "Modelling of Graphene/SiO2/Si(n) Based Metal-Insulator-Semiconductor Solar Cells", *4th Inter. Conf. on the Develop. in the Renew. Ener. Tech. (ICDRET),* pp 1-4, Feb. 2016.

[16] Sentaurus User Guide, Version G-2012.06, Jun. 2012, Synopsis ©

[17] Santanu Das, P. Sudhagar, Eisuke Ito, Dong-yoon Lee, S. Nagarajan, Sang Yun Lee, Yong Soo Kang and Wonbong Choi, "Effect of HNO_3 functionalization on large scale graphene for enhanced tri-iodide reduction in dye-sensitized solar cells", *J. of Mater. Chem.*, Vol. 22, pp. 20490-20497, Jul. 2012.

[18] Fethullah Günes, Hakim Arezki, Debora Pierucci, David Alamarguy, José Alvarez, Jean-Paul Kleider, Yannick J Dappe, Abdelkarim Ouerghi and Mohamed Boutchich, "Tuning the work function of monolayer graphene on 4H-SiC (0001) with nitric acid", *Nanotech.*, Vol. 26, pp. 445702-445708, Oct. 2015.

[19] Amal Kasry, Marcelo A. Kuroda, Glenn J. Martyna, George S. Tulevski, and Ageeth A. Bol, "Chemical Doping of Large-Area Stacked Graphene Films for Use as Transparent, Conducting Electrodes", *American Chem. Soci*., Vol. 4, no. 7, pp. 3839-3844, Jun. 2010.

[20] L. Zhu, G. Shao and J. K. Luo, "Numerical Study of Metal Oxide Heterojunction Solar Cells," *Semicond. Sci. Tech.,* Vol. 26, pp. 085026, Jun. 2011.

[21] Xinming Li, Dan Xie, Hyesung Park, Miao Zhu, Tingying Helen Zeng, Kunlin Wang, Jinquan Wei, Dehai Wu, Jing Kong and Hongwei Zhu, "Ion doping of graphene for high-efficiency heterojunction solar cells", *The Royal Soci. of Chem.,* Vol. 5, pp. 1945-1948, Jan. 2013.

This page is kept blank intentionally

Dual-Axis Solar Tracker

Ritik Mukesh Bhandari
Department of Electronics and Telecommunication Engineering Thakur College of Engineering and Technology
Mumbai, India
Email: ritikbhandari045@gmail.com

Sagar Prakash Jaiswal
Department of Electronics and Telecommunication Engineering Thakur College of Engineering and Technology
Mumbai,India
Email: sagar.jaiswal1720@gmail.com

Om Vimlesh Lal
Department of Electronics and Telecommunication Engineering Thakur College of Engineering and Technology
Mumbai, India
Email: omlal552@gmail.com

Ms Sukruti Kaulgud
Department of Electronics and Telecommunication Engineering Thakur College of Engineering and Technology
Mumbai, India
Email: sukruti.kaulgud@thakureducation.org

***Abstract*—As we are facing unavoidable shortage of fossil fuels in the future, different renewable sources of energy have become a topic of interest. Thus, new types of energy is getting more attention i.e. Solar energy which is one of the most available resource. It is a challenge to achieve maximum power output of solar energy in areas that does not receive high amount of solar radiation. Another difficulty faced is the installation costs of these panels are high. We need to make solar power more efficient, so that it becomes more dependable choice for the customers. One of the main methods of increasing the efficiency of the solar panels is that to maximize the duration of the exposure to the panels by the sun. Solar Tracking systems will help us to achieve this by keeping PV solar panels aligned at the appropriate angle with the sun rays at any time. The goal of this project is to build a light tracking system at smaller scale, but the design can be applied for any solar energy system in practice. It is also expected from this project a quantitative measurement of how well tracking system performs compared to system with fixed mounting method.**

Keywords—Solar Energy, Photovoltaic, Semiconductor, Dual Axes, Arduino

I. INTRODUCTION

After the invention of photo voltaic cells by using silicon, germanium type materials, solar history turned to a new generation. Solar also become an effective renewable energy source. The output of the solar panels mostly depends on the intensity of sun rays and the angle of incidence. As the sun is always moving the angle of incidence always changes. The output will be maximized whenever sun rays fall perpendicular to the panel. In initial days scientist used to arrange the solar panels in stationary position at a particular angle, such that the panel faces the sun most of the time. After the advanced experiments on the sun's path, scientists introduced one manual method, changing the solar panel tilting angle for every 3 months to improve output. Nowadays one best practice has come into the solar world that is solar tracking. A solar tracking is a method of orienting a PV panel toward the sun automatically.

Solar tracking decreases the angle of incidence of sun's rays on the panel. This maximizes the output power from a fixed amount of installed power generator. Tracking can be classified into two types: Dual axes and Single Axis. In Single axis solar tracker, solar panel moves in one direction (using single motor) where as in dual axes solar tracking panel moves in two directions (using two motors). The single axes tracker is very useful when the sun's path is stationary but as the sun's path changes with season as shown in figure, The Dual axes tracker, which follows the sun irrespective of its path, is very efficient.

In [1] solar tracker consist of a digital signal processor that is responsible for processing the signals from the Inertial Measurement Unit (IMU) and the radiation sensors. The signals are compared with a mathematical algorithm that calculates the position of the sun and then performs the control action to orient the solar panel. In [2] model they have partiality to use micro controller based dual axis solar tracking system. The angles of occurrence of sun beam are going to be 0°. They have used LDR for trace intensity of the light of the sun.The main plus point of their proposed model is that they have used two servo motor. In order to control two motor, system desires a lot of power. The tracker model of [3]is composed of 4 LDR sensor,2 stepper motors and PIC microcontroller.one set of sensors and one motor is used to tilt the tracker in sun's east-west direction and the other in the north-south direction. In [4] project they have used Arduino Software as the microcontroller that control the operation of the circuit according to the programmed that had been wrote. Proteus is used for designing the circuit for solar panel to battery. The proposed system in [5] tracks the sun both in azimuth and altitude angles .Two motors are actuated with the help of electromagnetic relays to provide azimuth and elevation angles based on the received sensor data connected to analog pins A2,A3,A4,A5 of Arduino.

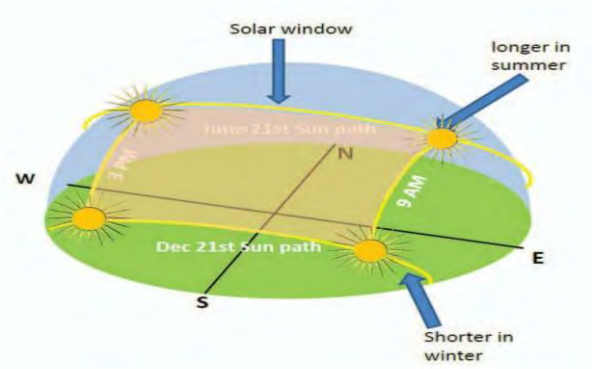


Fig. 1: Sun Path

II. System Design - Proposed Model

A. System Design

As we see in the block diagram, there are three Light Dependent Resistors (LDRs) which are placed on a common plate with solar panel. Light from a source strikes on them by different amounts. Due to their inherent property of decreasing resistance with increasing incident light intensity, i.e. photoconductivity, the value of resistances of all the LDRs is not always same. Each LDR sends equivalent signal of their respective resistance value to the Microcontroller which is configured by required programming logic. The values are compared with each other by considering a particular LDR value as reference. One of the two dc servo motors is mechanically attached with the driving axle of the other one so that the previous will move with rotation of the axle of latter one. The axle of the former servo motor is used to drive a solar panel. These two-servo motors are arranged in such a way that the solar array can move along X-axis also as Y-axis.The microcontroller sends appropriate signals to the servo motors supported the input signals received from the LDRs. One servo motor is used for tracking along x-axis and the other is for y-axis tracking .In this way the solar tracking system is designed.

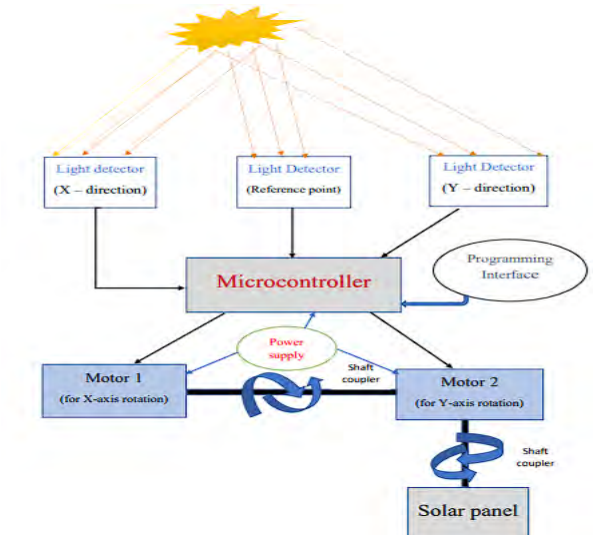


Fig.2: Block Diagram

B. Working of the Model

A pair of PIR sensors is used to collect the information of
Resistance of LDR depends on intensity of the sunshine and it varies consistent with it. the upper is that the intensity of sunshine , lower are going to be the LDR resistance and due
to this the output voltage lowers and when the sunshine intensity is low, higher will be the LDR resistance and thus higher output voltage is obtained. A potential divider circuit is employed to urge the output voltage from the sensors
(LDRs).The circuit is shown here.

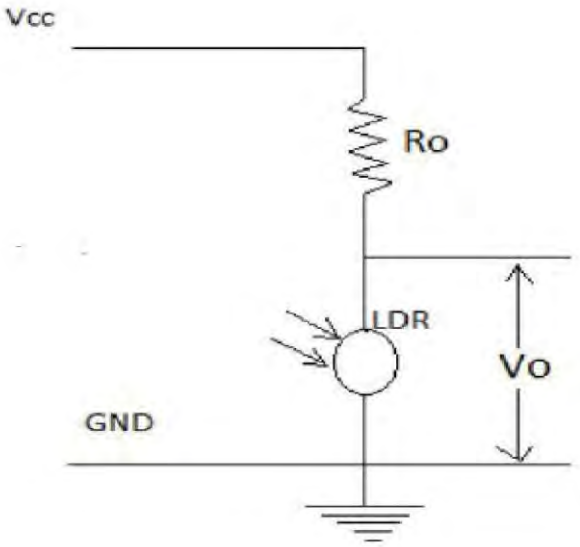
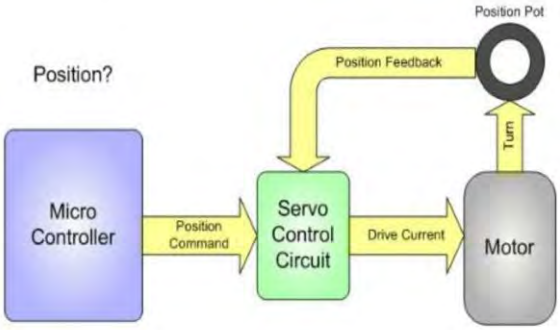


Fig.3: Circuit Diagram

The LDR senses the analog input in voltages between 0 to five volts and provides a digital number at the output which generally ranges from 0 to 1023.Now this may give feedback to the microcontroller using the Arduino software (IDE). The servo motor position are often controlled by this mechanism.



The tracker finally adjusts its position sensing the utmost intensity of sunshine falling perpendicular thereto and stays there till it notices any longer change. The sensitivity of the LDR depends on beginning of sunshine. It hardly shows any effect on diffuse lighting condition.

III. Expected Result and Discussion

The values obtained by the LDRs will be compared and if there is any significant difference, there will be actuation of the panel using a servo motor to the point where it is almost perpendicular to the rays of the sun.

This will be achieved using a system with three stages or subsystems. Each stage will have its own role. The stages will be;

1.An input stage that will be responsible for converting incident light to a voltage.
2. Control stage that will be responsible for controlling actuation and decision making.
3. A driver stage with the servo motor. It will be responsible for actual movement of the panel.

The input stage will be designed with a voltage divider circuit so that it gives desired range of illumination for bright illumination conditions or when there is dim lighting. The potentiometer will be adjusted to cater for such changes. The LDRs will be most suitable for this project because their resistance varies with light. They are readily available and are cost effective. Temperature sensors for instance would be costly. The control stage will have a microcontroller that receives voltages from the LDRs and determines the action to be performed. The microcontroller is programmed to ensure it sends a signal to the servo motor that moves in accordance with the generated error. The final stage will be the driving circuitry that consisted mainly of the servo motor. The servo motor will have enough torque to drive the panel. Servo motors are noise free and are affordable, making them the best choice for the project.
Creating an Automatic Dual Axis Solar Tracker which tracks the sun in both the X and Y direction and moves the Solar Panel as per the intensity of sunlight and gives efficiency higher than the fixed solar panel is the expected output in our project. The Single axis Solar tracker gives an efficiency of 13% as compared to that of fixed solar panel. Getting an efficiency greater than 13% that means greater than the single axis solar panel is the expected output.

□

IV. Conclusion

The dual axis tracker will perfectly align with the sun direction and track the sun movement during a more efficient way and can have an incredible performance improvement. The experimental results will show that dual axis tracking is superior to single axis tracking and glued module systems. Power Captured by dual axis solar tracker are going to be high during the entire observation period of time and it will maximize the conversion of solar irradiance into electricity output. The proposed system is cost effective also as a touch modification in single axis tracker can provide prominent power rise in the system. Through our experiments, we've found that dual axis tracking can increase energy by about 40% of the fixed arrays. With more works and better systems, we believe that this figure can raise more.

References

[1] Carlos Robles Algarín , Adalberto Ospino Castro, Jose Casas Naranjo, “Dual-Axis Solar Tracker for Using in Photovoltaic Systems,” International Journal of Renewable Energy Research C.R.Algarin et al. Vol.7 No.1, 2017.C.

[2] Amit Chakraborty Chhoton , Narayan Ranjan Chakraborty , “Dual Axis Solar Tracking System-A Comprehensive Study,” Proceedings of the 2017 4th International Conference on Advances in Electrical Engineering (ICAEE), 28-30 September 2018.

[3] Sadashiv Kamble, Sunil Kamble , Vaibhav Chavan, Anis Mestry , Nilesh Patil, “Dual Axis Solar Tracking System,” Novatuer Publications International Journal of Innovations In Engineering Research And Technology [IJIERT] ISSN: 2394-3696 Volume 2, 4APR.-2015.

[4] Baha Rudin Abd Latif, Muhammad Irfan Abdul Satar, “Developing a Dual-Axis Solar Tracker System with Arduino,” International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075 Volume-8, March, 2019.

[5] Divya Mereddy, Vijaya Rama Raju.V, Tharun Sadula , “Smart Dual Axes Solar Tracking ,” 2015 International Conference on Energy Systems and Applications (ICESA 2015), 01 Nov, 2015.

[6] Salish Maharjan, Durga Prasad Oli, Shekhar Raj Awasthi, “Dual Axis Solar Tracker: Design and Implementation,” International Journal of Scientific and Research Publications Volume 5, March 2015 .

[7] Siddhi Vichare, Neelam Vartekar , Taki Kunjumon, Sonali Sakhare, Prof. Manoj Mishra, “Dual Axis Solar Tracking System,” International Journal of Engineering Research & Technology (IJERT), 2017.

This page is kept blank intentionally

CMOS Image Sensors: Ideal for Digital Cameras

Ms. Sonia Behra

Thakur college of Engg. and Technology Thakur Village, Kandivli(E),

Mumbai-400101, India

sonia.behra@thakureducation.org

Dr. Payel Saha

Thakur college of Engg. and Technology Thakur Village, Kandivli(E),

Mumbai-400101, India

payal.saha@thakureducation.org

Ms. Anvita birje

Thakur college of Engg. and Technology Thakur Village, Kandivli(E),

Mumbai-400101, India

anvita.birje@thakureducation.org

***Abstract*— After the film camera, it has been a long journey for the digital cameras to evolve, but nowadays digital camera is the next big thing, everyday a new development is a must. The heart of the digital camera is the image sensor. The two most prominently used image sensors are Complementary Metal Oxide Semiconductor (CMOS) and Charge Coupled Devices (CCD).**

CMOS Active Pixel Sensors image sensors is based on sub-micron technology i.e. it has the complete processing unit on a single chip. This paper gives a short review of the advantages and shortcomings of both CMOS and CCD technologies as image sensors and justifies why CMOS is the next big thing for portable imaging devices

Keywords-CMOS image sensors, CCD image sensors, Digital cameras, Application-specific integrated circuit (ASIC), Active Pixel Sensor (APS), Digital Pixel Sensor (DPS), Charge Coupled Devices, Dynamic range, Quantum efficiency, Conversion gain, Dark current.

I. INTRODUCTION

Nowadays Digital cameras are finding wider applications and users as compared to traditional film camera because of low cost, light weight, size miniature. The trendy smart phones have miniature size of inbuilt digital camera with lower power consumption. Figure 1 is the basic layout of digital camera. It works on the same principal as optic nerves in the eyes of the human being.

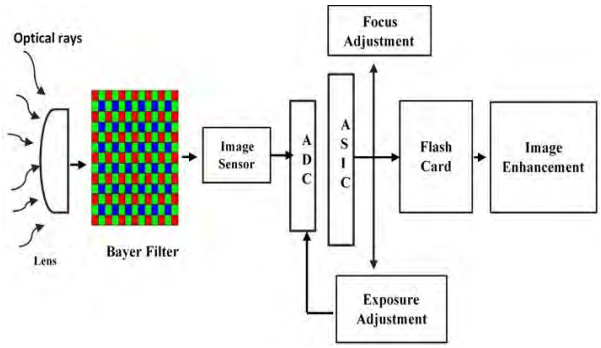


Fig. 1. Layout of digital camera

It is basically an optical communication system where the images are captured in the form of the optical rays through the lens, passed to the Bayer filter which arranges the RGB colour filters on a square grid of photosensors. These sensors are image sensors which are integrated circuits and have millions of light sensitive pixels, these convert the light signal into electrical signal which is processed through Analog to Digital Converter (ADC) and sent to Application-Specific Integrated Circuit (ASIC) whose basic function is to provide computational data, various operations can be performed on this and finally be available for user on LED screen to see.

These unique features of digital cameras also enable many new applications, such as network teleconferencing, video phones, guidance and navigation, automotive applications, and robotic and machine vision, etc.[1].

I. IMAGE SENSOR

The most important component in digital camera is the image sensor; its manufacturing technique is the same as that of integrated circuit and is mounted on silicon chip.

When an image which is in the form of light falls on this sensor, the light sensitive pixels in it senses the light levels and encodes the level into electrical signal.

Currently, there are two competing technologies of sensors: Charge-Coupled Devices (CCD) and Complementary Metal Oxide Semiconductor (CMOS) detectors[2].

A. Charge- coupled devices (CCD):

In CCD chips, capacitors are the light-sensitive pixel which are built from silicon on the chip using IC fabrication. Regeneration of electrons take place as the photons strike the silicon surface due to high kinetic energy and generate the electrons. These hot carriers charge the capacitor at the rate which is proportional to the intensity of light at that location. These charges are accumulated by the photodetectors during exposure time.

There are different types of CCD architectures, such as Full-Frame CCD (FF-CCD), Inter-Line Transfer CCD (IL-CCD), and Frame Transfer CCD (FT-CCD)[3]. Each architecture has its own advantages and disadvantages depending on the usefulness in the applications. Electron Multiplying CCDs (EMCCDs) is the latest CCD which is finding importance in the recent market trends.

In IL-CCD, new integration period starts right after the charge transfer to the register.as each pixel consists of a photodiode and one cell of a CCD register. This reduces the fill factor timing drastically and simultaneously establishes a very fast image capture due to which the possibility for it to be used in video mode increases tremendously. Thus today, with the use of micro-lenses, in IL-CCDs, the fill-factor limitation has been overcome and the IL-CCDs have become the most common CCD types in microscopy camera market. But during the readout time the accumulated charge is transferred sequentially to the vertical and horizontal CCDs, and shifted to the microchip output amplifier, where it gets converted to voltage signal. As the charge from each pixel is sequentially converted to voltage signal, the IL-CCDs have low noise and high uniformity. But, because of this sequential readout of pixel charge the readout speed is limited. Also, as CCDs are high capacitance devices, and during readout all the capacitances are switched ON at the same time with high voltages CCD image sensors usually consume lots of power. Nevertheless, most CCDs still need clocking signals with relatively large amplitudes approximately 5 – 10 Volts and well-defined shapes that are critical to their successful operation, requiring specialized clock drivers[4]. Multiple supply and bias voltages at non-standard values are often necessary, adding to system complexity and increased power consumption. It is worth noting that CCDs with lower clocking voltages of 2.5 V and power consumption of 146 mW for a 1.3 Mega-pixel sensor @ 15 frames/s have however recently been reported [5].

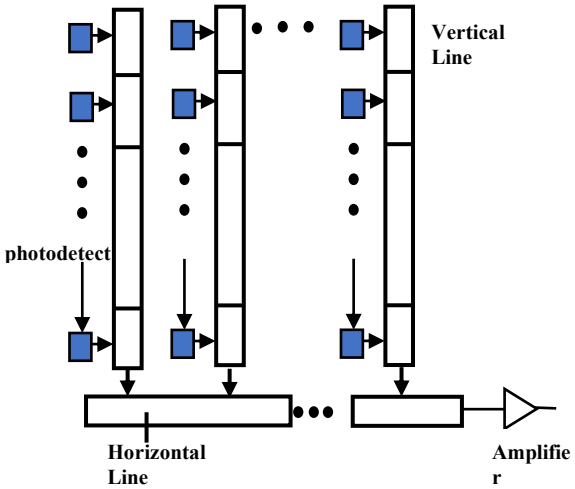


Fig. 2. Block diagram of interline transfer CCD sensor

Thus, a digital camera with CCD sensor not only comprises of a CCD sensor but also off-chip signal processing, noise reduction and readout circuits. Thus, although the generated noise is reduced by the off-chip noise reduction circuit but the at the cost of increase in the size and power requirement of the camera and hence cannot be used in portable cameras.

B. Complementary Metal Oxide Semiconductor (CMOS):

As CCD cannot be used in portable cameras, so to make portable and embedded imaging systems, it is essential that the image sensor should be integrated along with the circuitry that performs conversion and processing of light signals. If this is done than along with reduction in size, power consumption also reduces and the system becomes more robust.

As Complementary Metal-Oxide-Silicon (CMOS) technology is well known for implementing on chip signal processing circuits, therefore manufacturers are finding CMOS technology more beneficial than CCD to implement as image sensors. Thus, the latest trends in digital camera design, which is the use of CMOS image sensors instead of CCDs as the imaging devices.

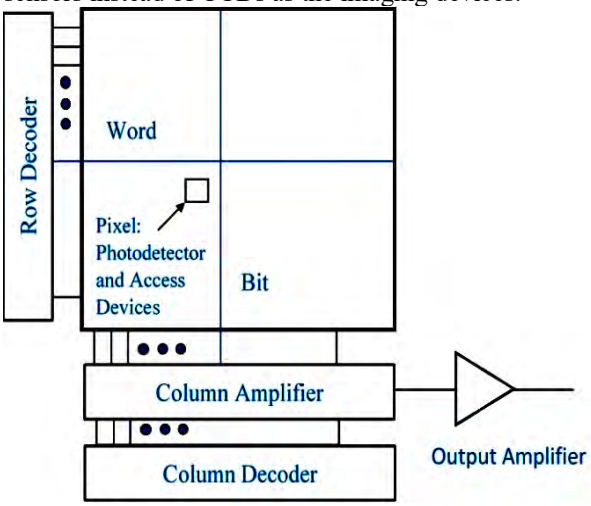


Fig.3. Block diagram of CMOS image sensor

CMOS sensors use column amplifiers and row and column decoders to adopt digital memory style readout. Thus, overcoming the problem of CCD sensors and having less power consumption and faster readout as random access of pixels is possible. Analog signal processing can be integrated onto the same substrate.

Mainly, CMOS image sensors can be grouped in three categories: Passive Pixel Sensors (PPSs), Active Pixel Sensors (APSs), and Digital Pixel Sensors (DPSs). Among these, APS sensors are the most common CMOS sensors in the microscopic camera market[6][7][8].

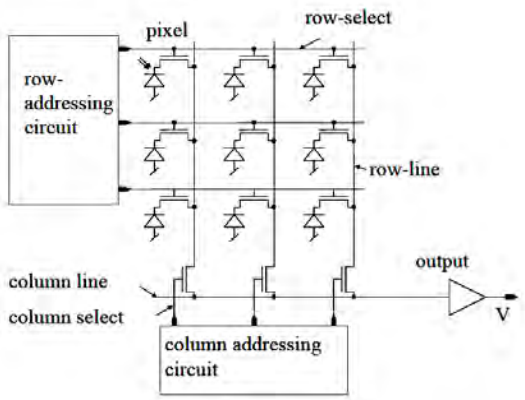


Figure 4: Architecture of CMOS passive image sensor [9]

Each pixel in the passive image sensor consists of the basic passive elements i.e. the photodiode and the MOS transistor that acts as the switch. The MOS switch transistor in the pixel is used for the row selection and the output i.e. the source terminal of this transistor is a common node for all the pixels in the same column. At the end of each column, there is a column select switch with column addressing circuit. The design also includes an off-chip amplifier. This simple structure results in high fill-factor. The basic disadvantage of PPS is the high parasitic capacitance at the common column node which is to be driven by the pixel and thus reduces the pixel's conversion efficiency.

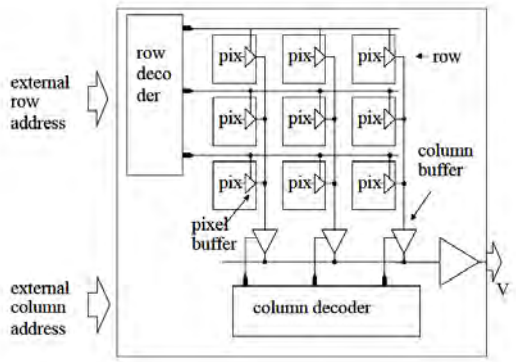


Figure5: Architecture of CMOS Active Pixel Sensor (APS) [9]

In the APS designs, each pixel has an active transistor which acts as the amplifier and provides pixel-level amplification and thus improves the image quality and lowers the noise read out and higher speed readout as compared to PPS designs. In APS it is also possible to generate column level or pixel level digital outputs, where both the techniques will speed up the readout process. With the advent of deep submicron CMOS technologies and micro-lenses, APS has now become the CMOS image sensor technology of choice [10][11].

DPS integrates an A/D converter into each pixel unlike PPS and APS where A/D conversion is performed at column level or chip level. Due to this DPS operates at lower power and higher SNR, but as it requires large amount of non-photosensitive/metallic area there is drop in the fill factor and rise in the pixel pitch. Thus the revision of the CMOS and CCD sensor digital cameras available in the market implies that a CMOS image sensor or camera can perform as good as a CCD image sensor or camera on various grounds and depending on the application specifications, the scientists should consider using low-cost CMOS cameras instead of high-cost CCDs.

C. Performance parameters of CCD and CMOS image sensors

Speed, Quantum efficiency, full-well capacity, conversion gain, dynamic range and, dark current, are main performance parameters of CMOS image sensor. Quantum efficiency is basically the generation of one electron hole pair with each incident photon. and ideally it should be 100 %. Full-well capacity and dynamic range are linearly related to each other; full well capacity is basically the measure of number of electrons generated. Higher the value of full-well capacity, higher dynamic range, and better signal to noise ratio. Conversion gain tells the efficiency of signal processing unit, higher the better. These performance parameters define the CMOS image sensor.

Dynamic Range

The figure6 below compares the dynamic range of CCD and CMOS sensors based on the literature review[12]-[25]. As it can be seen the mean value of the dynamic range for CMOS sensors is 72.36 dB, with a standard deviation of 16.27and that of the CCD sensors is 10.53dB with the mean value of 70.25 dB.

The mean difference between both is 2.11 dB, and the standard deviation of the mean difference is 8.9811.

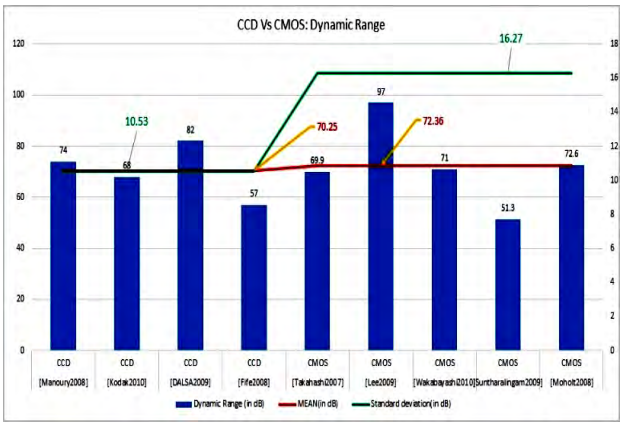


Figure6: Comparison of Dynamic range of CCD and CMOS Sensor

At 90% confidence the range is (-18.57.14.35), which clearly crosses a zero, therefore in terms of dynamic range the CMOS and CCD sensors does not make a significant difference at 90% confidence.

Dark Current

Based on the literature review a comparison on the dark current of CCD and CMOS image sensor is done which is shown in figure 7, the mean for CMOS is 17.73pA/cm2 having a standard deviation of 16.25pA/cm2.

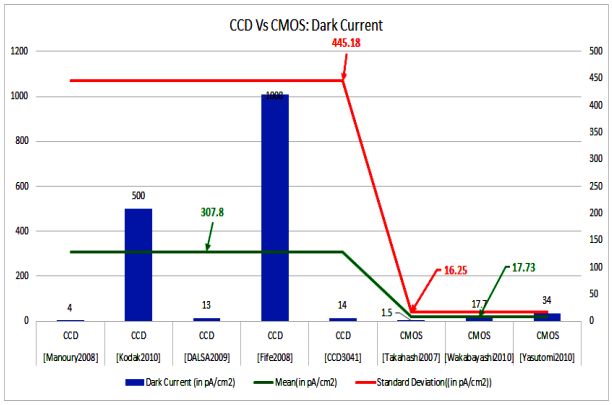


Figure7: Comparison of Dark current of CCD and CMOS Sensor

Applying the same analysis technique to the CCD sensor, the mean of the CCD dark currents is 307.8 pA/cm2, with a standard deviation of 445.18pA/cm2. The difference between the mean is 290.1 pA/cm2, and the standard deviation of the mean difference is 205.18pA/cm2. Thus, the effective degrees of freedom are 4.02. Also, the confidence range at 90% is (-135.87, 715), which again crosses a zero, so again with respect to dark current at 90% confidence there is no significance difference in both the sensors.

Conversion gain and Well capacity

There is a non-linear relationship between the conversion gain and well capacity. The relationship is given by the relationship ln(Conversion Gain) = 9.3329 - 0.539*ln(Well Capacity).

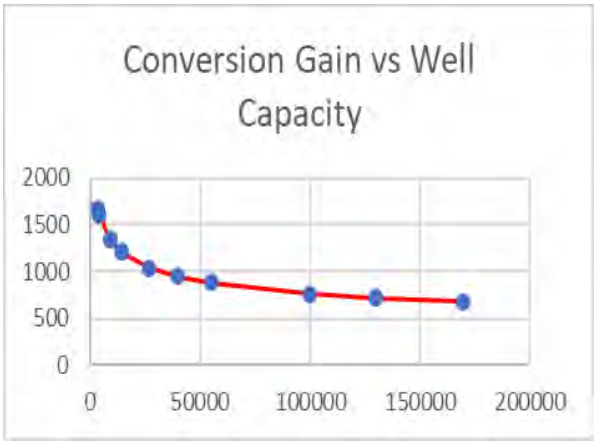


Figure8: Logarithmic regression between conversion efficiency and well capacity

This is because well capacity is nothing the amount of charge a pixel can hold during integration and is measured in electrons. The well capacity is related to dynamic range which is the ability of both the sensors to measure an accurate signal at low light intensity. Dynamic range is related to conversion gain which is the measure of change in output voltage in proportion to absorption of charge which is indirectly proportional to the well size. The logarithmic regression between the two shows that because of the
negative slope, the higher the well capacity, the lower the conversion gain will be.

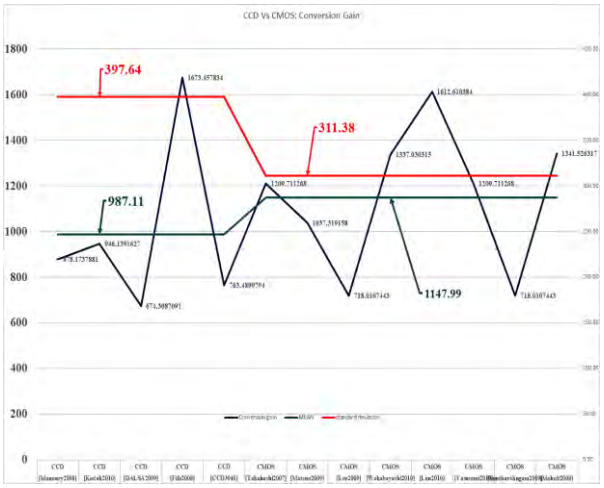


Figure9: Comparison of Conversion gain of CCD and CMOS Sensor

In figure 9, the mean of conversion gain for CMOS is 1147.99 having a standard deviation of 311.38. Applying the same analysis technique to the CCD sensor, the mean of the CCD conversion gain is 987.11, with a standard deviation of 397.64. it is interesting that although the difference is not huge as mean squared error is 0.618, and the standard deviation of the error is 0.977. The standard deviation of error for CCD is 2.159, while the standard error for CMOS is 0.21. Thus, confidence range at 90% confidence for CDD are (5.455,13.211), and for CMOS are (-0.916, -0.162) and both do not cross a zero.

Speed

As nowadays parallel architecture and the integration of all camera functions are fabricated on the single chip chip, it reduces the number of stray capacitances and inductances and thus the propagation delay.

As today's digital cameras are Megapixel imagers (1024x768 pixels), they can deliver up to 1000 frames/s at the full resolution using 32 analog outputs[26]. Recently digital CMOS sensors within pixel ADC have recently been developed in a 0.18 fm technology offering 10'000 frames/s at a resolution of 352 x 288 pixels [2].

Quantum efficiency (QE)

In the visible range for both CCD and CMOS sensors, the QE is excellent i.e. above 50% in the 400-700 nm. In visible range QE as high as 90% in the visible range has been achieved with back illuminated CCD as well as with CMOS sensors. But in UV range the QE the is limited by reflection and absorption in the top surface layers. It is nearly 57% and 60% for CMOS and CCD sensors, respectively.

Low power

While CCD cameras require numerous chips for the sensor, drivers and signal conditioning, the use of standard CMOS mixed-signal technologies allows the manufacture of imaging devices that can be monolithically integrated: The power consumption is 12 mW at the full speed of 60 images / s [27][11].

CMOS digital imagers with consumption even as low as 550 µW for a QCIF digital imager @ 30 frames/s have been reported[28].

II. Conclusion

After rigorous literature review, it was found that for next generation digital cameras, CMOS imaging sensor technology is quite stable and finding wider applications in the market for digital imagining even though they have noise and lesser dynamic range. This mainly comes from the fact that it can deliver at fast frame rates, wide dynamic range, high quantum efficiency. Also as compared to CCD the dynamic range is insignificant. Thus CMOS image sensors will be the choice not only for digital cameras but also for biomedical, automotive, applications that rely on customized sensors and smart pixels and most importantly in portable devices used in medical science due to higher integration capability on single chip, lower power consumption, smaller area and speed.

References

[1] G. C. Holst, "CCD Arrays Cameras and Displays", second edition. JCD Publishing, 1998.

[2] Stuart Kleinfelder et al., "A 10'000 Frames/s 0.18 mm CMOS Digital Pixel Sensor with Pixel- Level Memory", presented at the 2001, International Solid-State Circuits Conference, February 5, 2001

[3] RS Aikens, DAAgard, and JWSedat. Solid-state imagers for microscopy. Methods Cell Biol, 29: 291–313, 1989.

[4] Blanc, N. "CCD versus CMOS – has CCD imaging come to an end"? Zurich: D. Fritsch & R. Spiller, Eds. 2003.

[5] T. Yamada et al., "A 1/2 –in 1.3 M-Pixel Progressive-Scan IT-CCD for Digital Still Camera Applications", IEEE Transactions on Electron Devices, Vol. 48, n°2, pp. 222-230, 2001

[6] E. R. Fossum. "Active Pixel Sensors: are CCD's dinosaurs". In Proceedings of SPIE, pages 2-14, San Jose, CA, February 1993.

[7] S. Mendis et al. "Progress in CMOS Active Pixel Image Sensors". In Proceedings of SPIE, pages 19-29, San Jose, CA, February 1994.

[8]H. Tian, B. Fowler, and A. El Gamal. "Analysis of Temporal Noise in CMOS APS". In Proc. SPIE, volume 3649, pages 177-185, San Jose, CA, Jan. 1999.

[9] O. Vietze, "Active pixel image sensors with application specific performance based on standard silicon CMOS processes", Thesis work, ETH Zurich N° 12038, Switzerland, 1997.

[10] R. Panicacci et al. "128 Mb/s Multiport CMOS Binary Active-Pixel Image Sensor". In ISSCC96 Technical Digest, February 1996.

[11] S. Smith, J. Hurwitz, M. Torrie, D. Baxter, A. Holmes, M. Panaghiston, R. Henderson, A. Murray, S. Anderson, and P. Denyer. A single-chip 306x244-pixel, "CMOS NTSC video camera. In ISSCC Digest of Technical Papers, pages 170-171, San Fransisco, CA, February 1998.

[12] J. Nakamura, ed., Image Sensors and Signal Processing for Digital Still Cameras. CRC Press, 2005.

[13] E. Bogaart, et al. "Very Low Dark Current CCD Image Sensor," Electron Devices, IEEE Transactions on, vol. 56, no. 11, pp. 2496-2505, 2009.

[14] W. Lee, et. al., "A 1.9 e- Random Noise CMOS Image Sensor With Active Feedback Operation in Each Pixel", Electron Devices, IEEE Transactions on, vol. 56, no. 11, pp. 2436-2445, Nov. 2009.

[15] Fairchild Imaging Corporation, CCD 3041 Back-Illuminated 2K x 2K Full Frame CCD Image Sensor, rev. B, 2005.

[16] E.-J.P. Manoury, et al., "A 36x48 mm2 48M-pixel CCD imager for professional DSC applications," in Electron Devices Meeting, 2008. IEDM
2008. IEEE International, pp. 1-4, 2008.

[17] Eastman Kodak Company, Kodak KAI-2020 Image Sensor, revision 4.0 mtd/ps-0692, July 2010.

[18] Dalsa Corporation, DALSA IA-DJ High Quanta Imaging Sensor, 03-036-200007-01, Sep 2009.

[19] K. Fife, et al., "A multi-aperture image sensor with 0.7 μm pixels in 0.11 μm CMOS technology," Solid-State Circuits, IEEE Journal of, vol. 43, no. 12, pp. 2990-3005, 2008.

[20] H. Takahashi, et. al., "A 1/2.7-in 2.96 MPixel CMOS Image Sensor With Double CDS Architecture for Full High-Definition Camcorders",
Solid-State Circuits, IEEE Journal of, vol. 42, no. 12, pp. 2960-2967, 2007.

[21] S. Matsuo, et. al., "8.9-Megapixel Video Image Sensor With 14-b Column Parallel SA-ADC", Electron Devices, IEEE Transactions on, vol. 56, no. 11, pp. 2380-2389, Nov. 2009.

[22] H. Wakabayashi, et. al., "A 1/2.3-inch 10.3Mpixel 50frame/s Back-Illuminated CMOS Image Sensor", in Solid-State Circuits Conference
Digest of Technical Papers (ISSCC). 2010 IEEE International, pp. 410-411, 2010.

[23] Y. Lim, et. al., "A 1.1e- Temporal Noise 1/3.2-inch 8Mpixel CMOS Image Sensor using Pseudo-Multiple Sampling", in Solid-State Circuits
Conference Digest of Technical Papers (ISSCC). 2010 IEEE International, pp. 396-397, 2010.

[24] K. Yasutomi, et. al., "A 2.7e- Temporal Noise 99.7% Shutter Efficiency 92dB Dynamic Range CMOS Image Sensor with Dual Global Shutter Pixels", in Solid-State Circuits Conference Digest of Technical Papers (ISSCC). 2010 IEEE International, pp. 398-399, 2010.

[Suntharalingam2009] V. Suntharalingam, et. al, "A 4-side tileable back illuminated 3D-integrated Mpixel CMOS image sensor", in Solid-State Circuits *Conference Digest of Technical Papers (ISSCC). 2009 IEEE International*, pp. 38-39,39a, 2009.

[25] J. Moholt, et. al., "A 2Mpixel 1/4-inch CMOS Image Sensor with Enhanced Pixel Architecture for Camera Phones and PC Cameras", in *Solid-State Circuits Conference Digest of Technical Papers (ISSCC). 2008 IEEE International*, pp. 58-59, 2008.

[26] S. Lauxtermann et al., "A mega-pixel high speed CMOS imager with sustainable Gigapixel/sec readout rate", accepted for publication at the 2001 IEEE Workshop on Charge-Coupled Devices and Advanced Image Sensors, June 7-9, 2001, Cal-Neva Resort, Nevada 89402, USA

[27] N. Blanc et al., "Digital low-power camera on a chip", International Workshop on Intelligent Communication Technologies and Applications, with Emphasis on Mobile Communications, May 5-7, 1999, Neuchâtel, Switzerland.

[28] Kwang-Bo Cho et al., "A Micropower Self-Clocked Camera-on-a-Chip" presented at the 2001 IEEE Workshop on Charge-Coupled Devices and Advanced Image Sensors, June 7-9, Cal-Neva Resort, Lake Tahoe, Nevada USA.

This page is kept blank intentionally

NANOTECHNOLOGY APPLICATION IN AGRICULTURE

Ms. Anvita Birje
E&TC Dept.
Thakur college of Engg. and Technology Thakur Village, Kandivli(E),
Mumbai-400101, India
anvita.birje@thakureducation.org

Ms. Sonia Behra
E&TC Dept.
Thakur college of Engg. and Technology Thakur Village, Kandivli(E),
Mumbai-400101, India
sonia.behra@thakureducation.org

Ms. Megha Gupta
E&TC Dept.
Thakur college of Engg. and Technology Thakur Village, Kandivli(E),
Mumbai-400101, India
megha.gupta@thakureducation.org

***ABSTRACT*— Agriculture means farming, is most important sector because it creates and offers raw materials for food and feed industries. To enhance food quality nowadays Nanotechnology playing essential role in agricultural. Nanomaterials can be use in agriculture to reduce the amount of use of chemicals and optimum utilization of fertilizer. Nanotechnology develops more vivid ways and recent instruments to improve the agriculture and food industry with novel nanotools. Nanotechnology in agriculture includes specific applications like nanofertilizers and nanosensors for precision agriculture. With the help of nanofertilizers, nutrients levels increase the productivity without decontamination of soils, waters, and protection against several insect pest and microbial diseases. Nanosensors use for monitoring agricultural field soil quality and maintain the health of agricultural plants. This paper covers various application or use of nanaotechlogy in agricultural field.**

Keywords-Agriculture, Nanotechnology, Nanofertilizer, Nanopesticides, Nanosensors

INTRODUCTION

Agriculture is the backbone of most developing countries like India and it provides food for humans, directly and indirectly. Nowadays, due to limited natural resources like land, water, soil, etc. agricultural productivity must increase to feed a rapidly growing world population. Therefore, development in the agricultural is viable with new technology acceptance for superior agricultural production. The agriculture development also depends on the social spirit, health, environment condition, energy, ecosystem processes, natural resources etc. so development of agriculture totally depends on the latest and innovative techniques like nanotechnology.

Nanotechnology refers to the branch of science and engineering dedicated to designing, producing, and using structures, devices, and systems by manipulating atoms and molecules at nanoscale. Nano means a single nanometer (nm) is 1 billionth of a meter (size dimensions approximately 1–100 nm). A nanometer is so small that the width of a human hair is 80,000 nanometers. Nano will change its property, due to alteration in the atoms and develops a magnetic power.

The applications of nanotechnology can be appreciated and have the ability to make a significant impact on society. Nanotechnology has already been adopted by industrial sectors, such as the information and communications sectors, but is also used in food technology, energy technology, as well as in some medical products and medicines. [1]

Green nanotechnology is a safe process, energy efficient, reduces waste and minimizes greenhouse gas releases. Use of renewable materials in production of such products is beneficial, thus these processes have low effect on the environment. Nanomaterials are eco-environmentally sustainable and considerable developments have been made in the field of green nanotechnology.[2]

I. NANOMATERIAL

Any form of a material that has one or more dimensions in the nanoscale is known as nanomaterial. Materials that have one dimension in the nanoscale (and are extended in the other two dimensions) are layers, such as graphene, thin films, or surface coatings. Materials that are nanoscale in two dimensions (and extended in one dimension) include nanowire and nanotube. Materials that are nanoscale in three dimensions are particles, for example precipitates, dendrimers, fullerenes, colloids, and tiny particles of semiconductor materials (quantum dots). Nanomaterial-specific properties originated from their increased relative surface area and quantum effects [4].Agrochemical has some probable issues containing pollution of water or residues on food products that effect the human being and environmental health, thus the precise management and control in agriculture is required [3]. Nanotechnology applications for use in agriculture has become more common in this period, with a relevance in developing nanoagrochemicals like nanopesticides and nanofertilizers. Applications of nanotechnology focuses on plant protection and their nutrition level, in

the form of nanopesticides or nanofertilizers, referred to nanoagrochemicals.

In modern agriculture, use of smart nanotools has incredible potential to make a revolution in agricultural and its associated fields, and enhance both the quality and quantity of crops [4].

Nanotechnology can expand agricultural production, and its applications consist of:
1) Nanoformulations- Agrochemicals for applying pesticides and fertilizers for crop improvement.
2) Nanosensors/nanobiosensors- Crop protection for the identification of diseases and diagnostics, which enhance food quality.
3) Animal health, animal breeding, poultry production, fishery.

A. Nanoformulations:

Nanosilica has been effectively used to control a range of agricultural insect/pest and ectoparasites in animals. Such nanoparticles get absorbed into cuticular lipids cause insect death when applied on leaves and stem surfaces. For protection of plants or crops against insect pests and improve plant root health Nanoencapsulation technology is playing very important role in agriculture. Nanoencapsulation techniques is used to reduce use of chemical or its dosage with improving efficiency. These could include various bacteria or fungi that enhance the availability of nitrogen, phosphorus, and potassium in the root zone. In techniques of nanofertilizers, nutrients can be encapsulated by nanomaterials or nanoparticles or traditional fertilizers with nanoscale additives coated with a thin protective film to form a nanofertilizers.[5]
Nanofertilizers are used to increase nutrient efficiency and improve plant nutrition, compared with traditional fertilizers.
The gold nanorods substantially biological changes occurred of watermelon plant and confirmed phytotoxicity toward plant particularly at high concentration.
For the development of the green nanotechnology, a few plant species and microorganisms including bacteria, algae and fungi are being currently used for Nanoparticles (NPs) manufacturing. Nanomaterials have the ability to penetrate the seed coat and enhance the capacity of absorption and consumption of water.

B. Nanosensors/nanobiosensor:

The combination of biology and nanotechnology into nonosensors has greatly increased their capability to sense and identify the environmental conditions or damages. Biosensor is an analytical device which converts a biological response into an electrical signal. Biosensors can be made by using nanomaterials, such as metal (gold, silver, cobalt, etc.) NPs, CNT, magnetic NPs, and QDs.
In Food Packaging and Labelling nanosensors use to detect the oxidation process. In this, sensors indicate the colour change and information about the nature of the packed foods. This technology has been successfully applied in package of milk and meat.[10]
Nanosensors measure and monitor crop growth and soil conditions which will help to ensure soil and plant heath, product quality, and overall safety of environment. wireless nanosensor-based global positioning system (GPS) is used for real time monitoring of farmed during the growing season. The automation of irrigation system by using nanosensors has the wonderful capacity to utilize water efficiently. [11]
In Precision farming, Nano-biosensors can be effectively used for sensing a wide variety of fertilizers, herbicide, pesticide, insecticide, pathogens, moisture, soil pH, and their controlled use can support sustainable agriculture for enhancing crop productivity[6].
Even tiny wireless sensors can be evaluated levels of environmental pollution.[7] Bionanosensors are also detect bacteria and viruses, in that way quality of the food can be maintained. For detecting the heavy metals biosensors, electrochemical sensors, and optical sensors can be used.

C. Nanotechnology in animal production/reproduction:

Nanotechnology in animal improved the feeding efficiency and nutrition of agricultural animals also minimizing animal diseases, and turning animal by quality products. [9] Use of Nanoparticles in poultry products with high safety improved productivity in agriculture.
Aquaculture is the farming of fish and seafood ,it is a one of the rising sectors of the animal food producing sector. Impact of iron nanoparticles feeding on aquatic organisms shown a faster rate of growth. Supplemented diet like nanoselenium enhance the production . Water filter covered with silver nanoparticles blocked fungal infections.

II. APPLICATION

A few international organizations have organized workshops on the applications of nanotechnology for the agricultural sector, some of working on pilot projects.

A. To optimize greenhouse light quality:

For precision farming in greenhouses principle is to modify light spectra for plant growth. By increasing the photosynthetic efficiency of light reaching the sunshade, farmer get more efficiency in growing flowering and fruiting like tomatoes, lettuce and strawberries. Quantum dots uniquely modify sunlight to enhance photosynthetic efficiency and boost fruit and flower production.
UbiQD is an American company manufacturing innovating product in agriculture, clean energy, and security.
UbiGro, a luminescent layer of light that helps plants get more from the sun. It is designed to create an optimal growth environment spectrum for crops.

UbiGro luminescent films use novel quantum dot nanotechnology to harness the power of sunlight. UbiGro is essentially a layer of light in a greenhouse. UbiGro luminescent greenhouse film and its embedded nanotechnology facilitate light management in greenhouse settings. UbiGro films use quantum dots to convert UV and blue photons to longer wavelengths, resulting in the emission of orange/red light. UbiGro is a photoluminescent film that glows when illuminated with sunlight due to the conversion of short wavelengths to long wavelengths. This allows farmers to harness various wavelengths for photosynthesis and improve crop yields. By converting UV radiation and blue light to red/orange light, results in overall improvement in crop yield.

B. Climate control in a greenhouse:

Even Though greenhouse technology is a feasible way to sustainable crop production in regions with unfavourable climatic conditions. So climate control in greenhouses is presently one of the main objectives of engineering in precision agriculture. Nanomaterial can support the plants in the greenhouse to tolerate climate change. This can be in the form of modified temperature, water need, pH of the environment and nutrient requirements. This can be achieved by modifying seed or material for planting, structure and medium for delivery without damaging ecosytem. To control atmospheric greenhouse temperature evaporative cooling or fogging system is placed. Evaporative cooling technology utilizes water and cooling pads (spongy or porous media) of different materials to cool the air temperature. Water cluster can be changed when treated with nanoparticles via ultraviolet absorption spectrum and nuclear magnetic resonance (NMR) spectroscopy and it will increase water surface area to volume ratio and heat transfer in evaporative cooling of the air moving into the greenhouse. Hence, the feature of the cooling pad in the evaporative cooling of greenhouse can be upgraded with nanomaterials additives. [12]

C. Dryers for crops:

Drying of medicinal, aromatic plants and green vegetables are major challenge for farmers to sustain colour and aroma of the plants. Solar dryers are providing best energy optimization with shade drying. Thus, the researchers are simulating the shade drying in solar dryers by creating special glass. Nano-crystalline glass produced by the method of Aero-gel reflects proportion of incident solar radiation. It changes to dark colour when exposed to strong light and brighter at lowered sunlight. With this smart glass, the photosynthetic reaction of dried green vegetables can be reduced to preserve their dry green colour pigment. This way, overheating of solar dryers, devices and product qualities can be improved with requirement of lower drying temperature than other crops.

III. CONCLUSION

Nanotechnology play an important role in agriculture. Nanotechnology could become a potential source of emerging solutions for pollution by pesticides and fertilizers. Its objective is to produce various instruments or devices to meet the specific needs of certain crops and climates. It helps farmer to enhance productivity of agriculture through nanotechnology with less input sources and maximum output.

This technology impact in human life, economy, and science to provide innovative and economic development ways for human nutrition worldwide. Innovation uses in nanotechnologies in agriculture may help to meet the expanding demand for food and environmental sustainability.

REFERENCES

[1]Ram Prasad, Atanu Bhattacharyya, and Quang D. Nguyen, “Nanotechnology in Sustainable Agriculture: Recent Developments, Challenges, and Perspectives” Front Microbiol. 2017; 8: 1014.Published online 2017 Jun 20. doi: 10.3389/fmicb.2017.01014, PMC5476687

[2] Prasad R., Pandey R., Barman I., “ Engineering tailored nanoparticles with microbes:” quo vadis. WIREs Nanomed. Nanobiotechnol. 8 316–330. 10.1002/wnan.1363

[3] Kah M. (2015). “Nanopesticides and nanofertilizers: emerging contaminants or opportunities for risk mitigation” Front. Chem. 3:64 10.3389/fchem.2015.00064

[4] Sekhon B. S. (2014). “Nanotechnology in agri-food production: an overview”. Nanotechnol. Sci. Appl. 7 31–53. 10.2147/NSA.S39406

[5] DeRosa MC, Monreal C, Schnitzer M, Walsh R, Sultan Y. “Nanotechnology in fertilizers”. Nat Nanotechnol. 2010;5(2):91.

[6] Rai V, Acharya S, Dey N. “Implications of nanobiosensors in agriculture”. J Biomater Nanobiotchnol. 2012;3:315–324.

[7] Mousavi SR, Rezaei M. “Nanotechnology in agriculture and food production”. J Appl Environ Biol Sci. 2011;1(10):414–419.

[8] Otles S, Yalcin B. “Nano-biosensors as new tool for detection of food quality and safety”. LogForum. 2010;6(4):67–70.

[9] hen H, Yada R. “Nanotechnoogies in agriculture: new tools for sustainable development”. Trends Food Sci Technol. 2011;22(11):585–594.

[10] Bumbudsanpharoke N., Ko S. (2015). “Nano-food packaging: an overview of market, migration research, and safety regulations”. J. Food Sci. 80 R910–R923. 10.1111/1750-3841.12861

[11] Yifen Shang , Md Kamrul Hasan , Golam Jalal Ahammed , Mengqi Li , Hanqin Yin , Jie Zhou “Applications of Nanotechnology in Plant Growth and Crop Protection: A Review” PMID: 31337070, PMCID: PMC6680665, DOI: 10.3390/molecules24142558

[12] M.C. Ndukwu,C.E. Ikechukwu-Edeh,N.R Nwakuba,I Okosa,I.T. Horsefall,F.N. Orji “Nanomaterials application in greenhouse structures, crop processing machinery, packaging materials and agro-biomass conversion” Materials Science for Energy Technologies ,Volume 3, 2020, Pages 690-699

This page is kept blank intentionally

IoT Based Hospital Inventory Management System

Anjali Nilendu Jha
Electronic & Telecommunication Department
anjalirjha@gmail.com

Mrs. Payel Saha (Professor)
Thakur College of Engineering & Technology
Mumbai, India
Payel.saha@thakureducation.org

***Abstract*- In this paper, an IOT stock organization system has been arranged which will be an ideal response for all essentials and expects of crisis center and clinical stores. By realizing the stock organization subject to IOT, we dispense with the man power(staff) and make it automated between the assessment and solicitation circumstance stages, hence improving the capability of stock organization. The idea utilizes the edge regard and glancing through medications and oxygen chamber near to facilities and close by clinics and clinical stores if there ought to emerge an event of emergency and a getting ready device with ability to interface with the Internet, for instance, a Raspberry Pi, to measure the stock and establish a connection with the chief and from administrator to supplier and furthermore to the near to centers and clinical stores and different emergency clinics for demand position.**

Keywords: IOT, Raspberry-Pi, Database, IMS

INTRODUCTION

The venture IOT Based Inventory Management System is a finished work area-based application planned. The primary point of the task is to create Inventory Management System Model programming in which all the data with respect to the load of the association will be introduced. It is an intranet-based work area application which has administrator segment to deal with the stock and upkeep of the stock framework. Stock administration alludes to the figuring of the accessible stocks. Stock administration is executed in the different phases of the creation line. This framework isn't just restricted to businesses, yet are reached out to clinical and different fields moreover. This work area application depends on the administration of supply of an association. This application likewise gives the limit an incentive on the stocks as it arrives at the framework send the notice to executive and quest for the accessibility in close by clinics by sending a solicitation warning. Each new stock is made and entitled with the named and the section date of that stock and it can likewise be refreshing whenever needed according to the exchange or the deals is returned in the event that. Here the login page is made so as to secure the administration of the supply of association so as to keep it from the strings and abuse of the stock.

The mind-boggling issues include the stock administration of medication, oxygen chamber, and accessibility of beds in this pandemic. In clinical applications, they are utilized in efficient capacity and stock refreshing of medications. The innovation utilized for this efficient stock administration depends on Internet of Things. IOT is essentially an actual organization of segments with implanted delicate product, electronic ideas, and parts. It permits different parts to be detected and distantly kept up by an organization framework. It additionally encourages joining in the midst of the actual space and PC like frameworks.

LITERATURE SURVEY

A commonplace stock administration framework accessible in the market is worked around programming, which screens the stocks. The stock subtleties are refreshed by the staff of the clinic by different strategies. One such strategy incorporates standardized tag scanners.

In the current framework the ultrasonic sonic sensor, faculties and the regulator bring the information can ship off cloud and through cloud a notice is send on the director telephone that the stock isn't accessible. And afterward the head administrator physically submits a request to the providers.

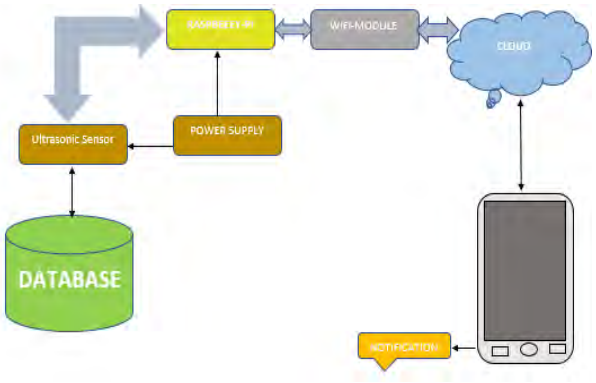


Figure 1: Existing IMS

Functional Block Diagram of the proposed system

In our design, the system strives to improve the performance, yet maintain the simplicity of the system. Here, we utilize the intensity of IOT to streamline and make it efficient by disposing of any pointless human impedance and mechanizing the whole organization liable for stock administration. The difference line

between the existing design and the proposed new design is that the use of dedicated and reliable hardware for this IMS system.

The database stores the stocks of medicines and oxygen cylinders. Threshold value is set for medicines and the cylinder as it reaches to threshold value the administrator receives a message notification with a provided link to place an order and an additional link for searching near by hospital and clinics for that specific medicine and for the oxygen cylinder. By clicking on the second link the near-by hospitals receive a request message for that medicine or the cylinder and checks for the availability if is available than they reply with a yes.

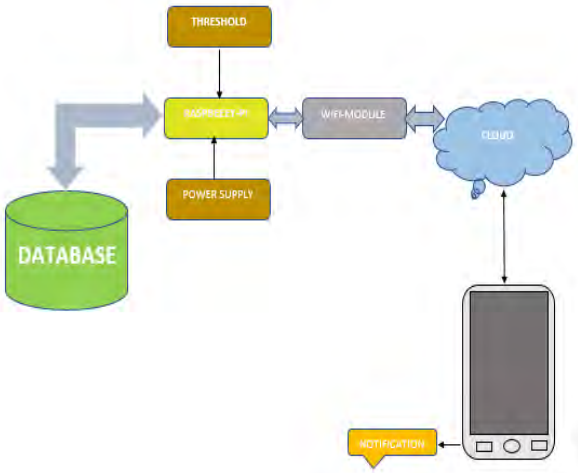


Figure 2: Functional Block Diagram of IOT Based IMS

As in some cases there may be multiple choices as many hospitals and clinic have that than our system will decide the nearest one from our hospital and acknowledge the nearest one to transfer it. First link is to place an order from suppliers so the system automatically places the order.

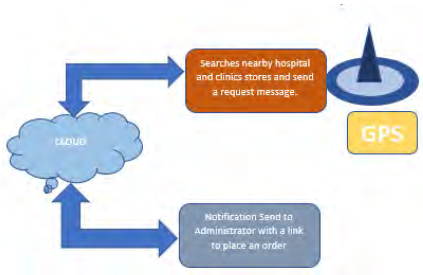


Figure 4: Flow Chart of IOT Based IMS

Figure 3: Cloud Function

The above figure shows the flow chart of the proposed IOT based IM system.

SOFTWARE IMPLEMENTATION AND ITS REQUIREMENT

- **Database**

An information base is an assortment of data that is sorts out so it can undoubtedly be gotten to, oversaw and refreshed. In one view, information base can be grouped by kinds of substance: book index, full-text, numeric, and picture. In registering, information base is at some point ordered by their authoritative methodology. A circulated information base is one that can be scattered or recreated among various focuses in an organization.

Social Database IMS has the social information base model. A social information base is an advanced information base whose association depends on the social model of information. This model composes

information into at least one tables of lines and segments. These tables here have the connection. The connection is kept up by the extraordinary key characterized in each column. The key can be essential and unfamiliar relying upon their temperament of association. The standard client and application program interface to a social information base is the organized inquiry language (SQL). SQL articulation are utilized both for intuitive questions for data from social information base and for get-together information for reports or section in another table subsequently setting up a connection between them.

• Thinger.IO

It is an open source stage for IOT. It gives adaptable cloud framework to interfacing things, gadgets. With the Thinger.IO, gadgets can be controlled from web in practically no time. To utilize the Thinger stage initially make a record in the Thinger stage. In the comfort a dashboard, it will show the quantity of gadgets associated. It can associate up to 4 gadgets all at once in the stage. In Devices, you can oversee and get to the thing .it shows the number of gadgets are associated in the undertaking. A dashboard is made utilizing a dashboard id, every dashboard can be associated with various sensors and actuators. Gadgets is made in the dashboard for checking the qualities.

Hardware Implementation and Its Requirement

- **Raspberry Pi**

The core of the framework depends on the scandalous Raspberry Pi. There are different models of Raspberry Pi accessible in the present market. This plan was executed on the Raspberry Pi Model B. The Raspberry Pi Model B supports a 1 GHz processor with a 512MB RAM. It likewise has two on board USB ports, an Ethernet port and a 26 pin extension header with GPIO, I2C, and so on The raspberry Pi GPIO takes a shot at 3.3 Vlogic, and it is important to utilize a level shifter while interfacing it with a 5 V Sensor. The Raspberry Pi stacks its necessary working framework from the SD card. There are different OS accessible, however we are especially inspired by the Debian Raspbian Wheezy. The Raspberry Pi can be gotten to through a screen, mouse, and a console or utilize it headless by means of SSH. The accessibility of the Ethernet port and the USB port enables the Raspberry Pi to associate with the Internet. At the point when the Raspberry Pi is associated with the Internet, utilizing mail move conventions, we can send sends consequently through our program Python.

• WIFI Module (Node MCU)

NodeMCU is an open source IoT stage. Its firmware runs on the Wi-Fi SoC of ESP8266 and the equipment is planned dependent on the ESP12 module. The Node Micro Controller Unit (NodeMCU) is utilized as an entryway. It has inbuilt Wi-Fi module which is utilized to send the sensor information to cloud for capacity and examination. The fundamental purpose for choosing NodeMCU is that the sensors utilized in our undertaking utilizes just advanced pins and one simple pins are required. Additionally, it burns-through less force (3.3v) and is of minimal effort when contrasted with different microcontrollers/processors like Arduino and Raspberry pi. Hub MCU is associated with ultrasonic sensors, gas sensor, temperature sensor, IR sensor. All the qualities are associated and ship off Cloud worker. The ESP8266 is planned and made by Espressif Systems. NodeMCU contains all vital components of the advanced PC: CPU, RAM, organizing (Wi-Fi), and even a cutting edge working framework and SDK. When bought at mass, the ESP8266 chip costs just $2 USD a piece. The highlights like setting up a Wi-Fi association with only a couple lines of code, Plug and play mode, Programmable Wi-Fi module and Arduino like programming and equipment I/O made NodeMCU an IoT Tool that is best appropriate for different applications dependent on IoT. It has a profound rest mode which devours 60mA is valuable for the low force utilization of an application.

• GPS (Global situating framework)

The Global Positioning System (GPS) is a satellite-based route framework comprised of an organization of 24 satellites put into space by the U.S. Branch of Defense. GPS was initially planned for military applications, yet in the 1980's, the legislature made the framework accessible for regular citizen use. GPS works in any climate conditions, anyplace on the planet, 24 hours per day, 365 days every year. The 24 satellites that make up the GPS space portion are circling the earth around 12,000 miles above us. These satellites are going at velocities of around 7,000 miles 60 minutes. GPS satellites are fueled by sun based energy. They have reinforcement batteries locally available to keep them running in case of a sun oriented obscuration, when there's no sun based force. Little rocket sponsors on each satellite keep them flying in the right way. Each satellite weighs around 2,000 pounds and is worked to last around ten years.

CONCLUSION

It is apparent that this framework can be practical. As, the framework straightforwardly makes an impression on the overseer, and from director to the provider to submit a request. Likewise, it looks through the medication and oxygen chamber in close by medical clinics and centre stores if there should be an occurrence of crisis during that time interface gave by framework. Since the edge esteem is picked to such an extent that the stocks are sufficient for activity till the new stocks show up, the framework is self-continued and there is no deferral caused due to insufficient stock. In view of the minimal effort, simple usage, and efficient plan, it very well may be actualized in clinics. In spite of the fact that it has a few constraints, however the usage of this framework will profit the association.

REFERENCES

[1] S. Jayanth, M.B. Poorvi and M.P. Sunil**, "**Inventory Management System Using IOT", January 2017 ,Reseachgate https://www.researchgate.net/publication/311216054_Inventory_Management_System_Using_IOT

[2] Eymundur Sveinn Leifsson, "Inventory Management at the National University Hospital of Iceland", Faculty of Industrial Engineering, Mechanical Engineering and Computer Sciences University of Iceland 2012

[3] Pai, Pradeep G., "An Adaptive Inventory Management System for Hospital Supply Chain" (2018). Thesis. Rochester Institute of Technology. Accessed from

[4] Beamon, B.M., "Measuring supply chain performance." International Journal of Operations & Production Management, 1999, 19(3), pp.275-292.

[5] Burns, D.M., Cote, M.J. & Tucker, S.L, "Inventory analysis of a pediatric care center", Hospital Materiel Management Quarterly, 2001., 22(3), pp.84-91.

[6] Duclos, L.K., "Hospital inventory managment for emergency demand" International Journal of Purchasing and Materials Management., 1993., 29(4), p.30.

[7] Im, J.H. & Schonberger, R.J., "The Pull Of Kanban", Production and Inventory Management Journal, 1988., 29(4), pp.54-59.

[8] Silver, E.A., Pyke, D.F. & Peterson, R. "Inventory Management and Production Planning and Scheduling", 1998., 3rd ed., John Wiley & Sons.

[9] Souvik Paul, Atrayee Chatterjee, Digbijay Guha, "STUDY OF SMART INVENTORY MANAGEMENT SYSTEM BASED ON THE INTERNET OF T", BCA Department, The Heritage Academy,2019., India.

[10] Lizong Zhang, Nawaf Alharbe and Anthony S. Atkins, "An IoT Application for Inventory Management with a Self-Adaptive Decision Model", Electronic ISBN:978-1-5090-5880-8.,15-18 Dec. 2016 Print on Demand(PoD) ISBN:978-1-5090-5881-5

Wireless Power Transmission via Solar

Riddhi Vora
Electronics and telecommunication
Thakur College of engineering and technology
Mumbai,India
riddhivora23@gmail.com

Sathvik Shetty
Electronics and telecommunication
Thakur College of engineering and technology
Mumbai,India
sathvikshetty0201@gmail.com

Chirantan Sinha
Electronics and telecommunication
Thakur College of engineering and technology
Mumbai,India
sinhachirantan@gmail.com

Project guide: Mrs. Kalawati Patil

***Abstract*— Everyone in today's fast-paced society is in constant need of portable technology. Power is the customers' most frequent concern; where and how do all of our appliances get charged. Wireless charging provides for tension relief and slowing down and plugging in answer. The ability to have electricity without being bound to all our gadgets by cables and, theoretically, without even thinking about it. It is a unique type of charging method in which there is no need for communication. Wire of any kind used to connect the power supply to charge it. Smartphones or handheld devices wireless within a limited range of step away. In the form of an inductive coupling, this concept involves the design and implementation of a versatile charging system that combines solar charging and wireless power transmission (WPT). During this project, the team developed and created a fully functional product via a three-stage design plan. First, a trial stands for proof of concept (POC) that demonstrates the potential of the technologies that we have selected to function correctly in our specific application. Second, a prototype using these principles has been built to test and explore possible future changes. Based on product and performance specifications, this prototype has been planned and developed by our team. Third, a version of our definition has been finalized. Improvements and upgrades to our prototype from a test suite. This technique uses non-conventional power source (solar cell) techniques for the wireless charging of the device. In particular due to a wireless charger, the life span of a mobile charger increases compared to a standard charger. The method proposed is environmentally friendly. Comfortable and user friendly. We can use the receiver Pad to make all mobile wireless devices compatible. The system is capable of charging any smartphone, anywhere at any time.**

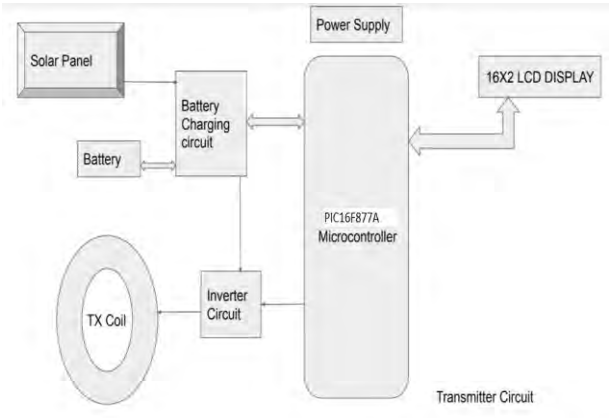
***Keywords*—Solar Power, Wireless Power Transmission (WPT), Mobile Charger, Transmitting Coil, Receiving Coil, Magnetic Resonance.**

I. INTRODUCTION

In this Project, we have presented idea of transmitting power from solar which get converted into DC power and to charge mobile phone. Nowadays electrical power generation and transmission become very challenging due to high demand. To overcome this renewable energy sources and the conventional energy transmission should be redesigned to get higher energy utilization. This paper describes about wireless power transfer system using magnetic coupling. Coil which is used in the project is Toroidal coil. With the abundant solar energy in our country, it is essential to extract the maximum solar power at higher efficiency. The innovation of wireless power transfer developed from the inconvenience of having too many wires connected in small power sockets. We thought that many of us have the same experience of having not enough sockets for our electronic devices. The objective of this project is to design and construct a method to transmit wireless electric power and charge designated low power devices. The system will work by using Toroidal coils to transmit power from an AC line to a resistive load. In this project at the receiving part we are going to charge the mobile phone by converting DC to AC.

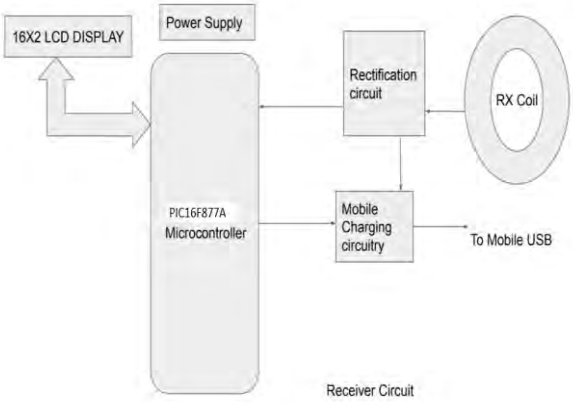
Every WPT technology has its own advantages and disadvantages. The main research themes of all WPT technologies focus on improving the transmission efficiency and distance. Here, there is one transmitting circuit and one receiving circuit. Both circuits consist of coils, with the help of the coils both circuits can come in contact and could help to transfer power generated from transmitted circuit to receiving circuit. In the project, coil used is TOROIDAL coils. Solar panel will give voltage up to 12V but in the project all circuits are working in 5V. A 40 pin microcontroller named PIC16F877A having 8-bit ROM is used at both transmitting as well as receiving circuit.

II. BLOCK DIAGRAM



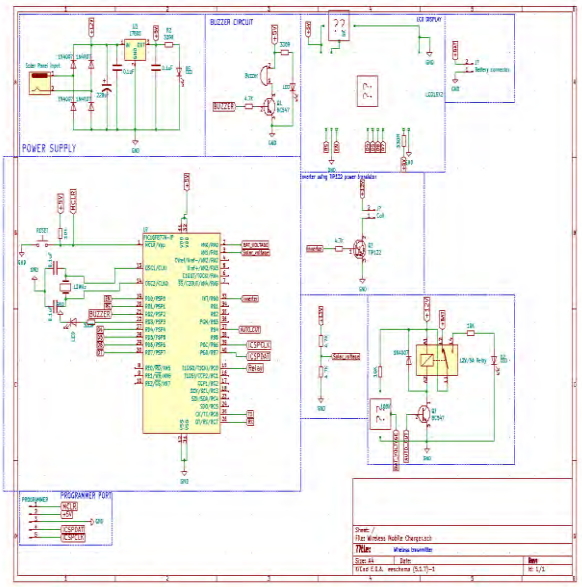
Solar panel is placed at the start of the diagram. Solar panel will receive DC current . A rectifier diode 1N4007 is placed at Power supply which will convert the DC to AC .A Battery charging circuit is placed next to solar panel inorder to manage battery to be supplied. A 40 pin PIC16F877A micocontroller is used here. The 40-pin IC has 14 Channel 10-bit ADC making it

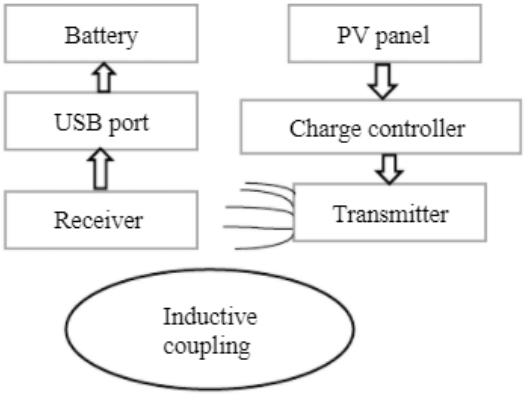
suitable for applications which require more ADC inputs. The IC also has 2 Comparators, 2 Timers (8-bit and 16-bit) and supports SPI, I2C and UART communication protocols. In this project, circuits are working in 5V. We also placed 16*2 LCD display to check the transmission of power. There is an Inverting circuit which uses TIP122 Power transistor. Two coils are present, one at transmitting circuit and another at receiving circuit. These are inducting coils, to transfer power from transmitting circuit to receiving circuit they need to come in contact. Hence, one coil is placed at the end of transmitting circuit and another is placed at receiving circuit.



Here, RX coil will receive AC current and will pass the current to Rectification circuit where the current would get rectified and get converted from AC to DC. The current is then passed to 40 pin PIC16F877A microcontroller. Then current is passed to Mobile Charging circuit where it would regulate the current and voltage supplied to mobile for charging. And then it is passed to Mobile USB from where mobile gets charged.

Here is the Hybrid of Transmitting and receiving block diagram:





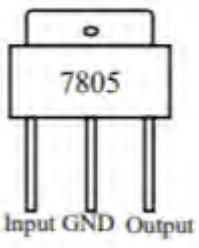
III. CIRCUIT DESCRIPTION:

TRANSMITTING CIRCUIT.

Solar Setup for Power Supply:

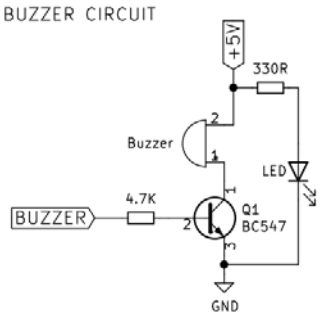
During the hardware implementation portion, a storage device is required to store the produced energy by photovoltaic cells. A battery is a common storage device which is used to store electrical energy produced by photovoltaic cells. To charge a battery by using a solar PV, a charge controller is an important device. Therefore, it will be necessary to connect a charge controller in series between the solar panels and the battery.

Setup of Voltage Regulator:



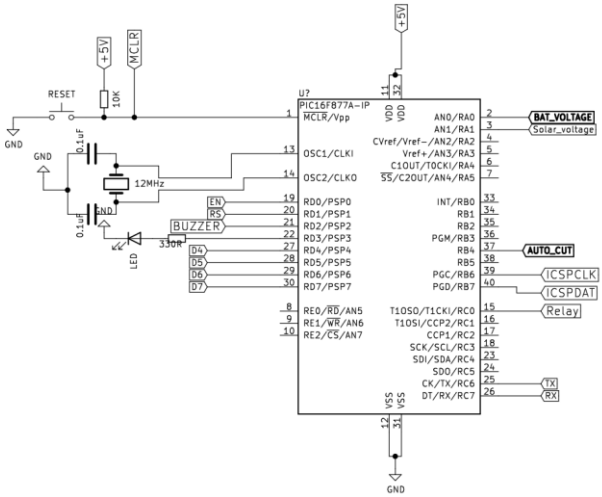
The voltage regulator IC 7805 maintains a constant voltage output for fluctuating of an input voltage and the output voltage is +5 volt. It has 3 pins. Pin number 1 is for input, pin number 3 is for output and pin number 2 is for ground. In this system, pin number 1 is connected with the source as well as a capacitor C5. It is also connected with the tuned LC circuit. We get voltage of 12V from the photovoltaic cell, but the circuit in the project works in5V. Hence, to maintain and regulate 5V we use voltage Regulator.

Buzzer circuit:



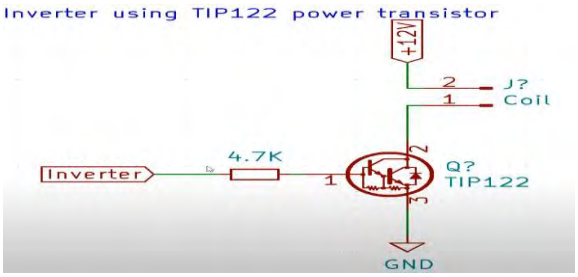
In buzzer circuit we have a transistor and a buzzer. We are using a transistor in buzzer circuit in order to amplify the current. The LED is connected in parallel with the buzzer. So, when buzzer is on LED will also glow. Buzzer will start beeping or ringing when the voltage flow is interrupted or stops.

PIC16F77A microcontroller:



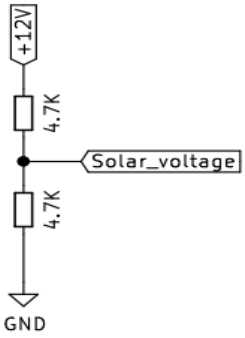
One of the most renowned microcontrollers in the industry is thePIC16f877a microcontroller. This microcontroller is very convenient to use, and it is also easier to encode or programmed this controller. One of the main advantages is that FLASH memory technology can be used to write-erase as many times as possible. It has a total of 40 pins and 33 input and output pins are available. In many microcontroller projects, PIC16F877A is used. In digital electronics circuits, PIC16F877A also has a lot of applications. We use a 12MHz crystal oscillator here. We use tags such as buzzers, battery voltage, etc. in the circuit to prevent the mess of connecting wires.

Inverter:



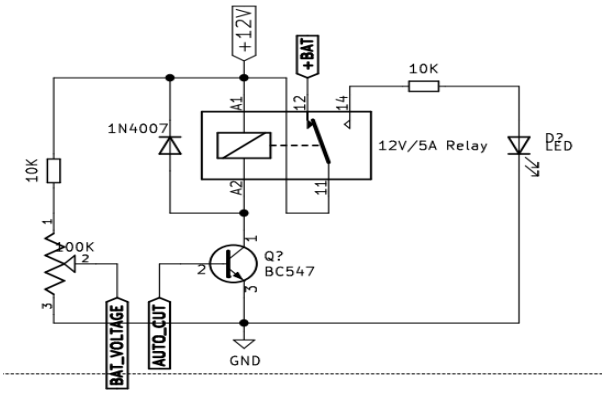
We are using TIP122 power transistor. TIP122 is Darlington pair transistor as they are having two transistors interconnected. The coil is attached here with respect to +12V. The TIP122 is connected between +12V and ground. Inverter is always attached to the interrupt pin in microcontroller. There is continuous flow of pulse width modulator at the input of inverter and TIP122 power transistor will generate square wave at the output. When square wave gets generated the current starts oscillating. Due to oscillation effect, we can produce AC signal. This is how DC is converted to AC by using inverter TIP122 Transistor. Higher the frequency at PWM, higher the frequency gets generated at the coil.

Voltage Divider:



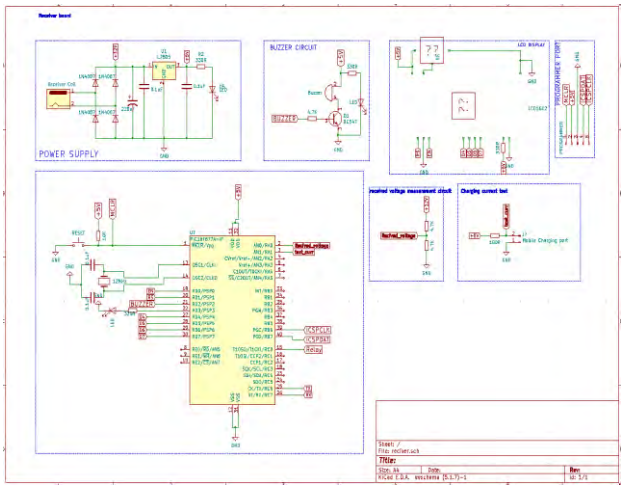
The equation for voltage divider is
V=Vin*(R2/R1+R2)
Where,
Vin =12Vs
R1=4.7k
R2=4.7k
V=6Vs
Here,12Vs will not remain constant as the rotation of the earth will result in variation of the voltage. For eg, when sun is perpendicular to the solar panel it would give 12Vs but as the position changes the output of solar panel also changes. The tag of solar voltage is connected to analog pin1. Analog pin at the microcontroller will take the analog readings and converts the analog value in digital value and will display in form of Voltage. From here we can keep track of how much voltage is coming from solar panel and will display value.

Battery charging:



There is a relay of 12V,5Amp. The 12V signal is ultimately connecting through a common pin of a relay to a battery i.e. tag of battery and 12V is directly going to battery and the same 12V is also connecting to 10k resistor and 100k potentiometer arrangement. The middle pin, is used as voltage divider just like we used it for measuring solar voltage and also this pin we measure battery voltage. The battery voltage is connected to pin no2 of PIC16F877A microcontroller i.e. analog 0. This way we can continuously measure the voltage of the battery. Here, the 12Vs plus the voltage of battery is measured because 12V and battery are ultimately connected together in relay pin. When the relay is off, the pin will be connected to battery. Similarly, when relay is on, the pin losses its connection with battery. There is a LED placed with 10k resistor which indicates the amount of battery collected by solar. The main job of battery is, it gets glow when the battery is fully charged.

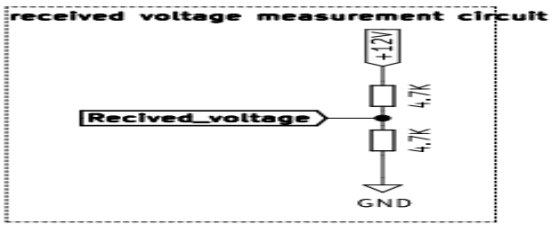
Receiving Circuit:



RECEIVING CIRCUIT.

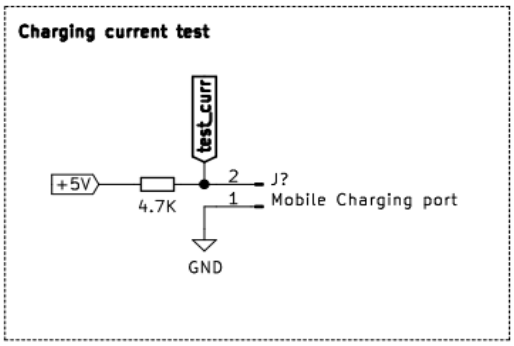
In the receiving circuit the Power supply, Buzzer and PIC16F87A microcontroller is same as transmitting circuit. Only the received voltage measure circuit and the charging current test circuit are added here instead of inverter, voltage divider and battery charging. The current will pass from coil at the transmitting circuit to the coil of receiving circuit. The coils should be Resonant inductive coupling. The resonating frequency between both coils must be same. Power can be transferred only if both coils have match frequency.

Received voltage measure circuit:



Receiver voltage circuit measures the amount of voltage coming after transformation at receiving part. It is similar to voltage divider circuit in transmitting part. The 12Vs mentioned here is the voltage we are getting at receiving coil. It will measure the voltage which is received after rectification. The tag received voltage is attached to the microcontroller AN0 i.e. pin no 2.

Charging current test circuit:



The 5V coming here is from voltage regulator L7805 because mobile needs 5Vs charge. There is 100 ohms resistor placed next to 5Vs because exact 5Vs charge must be applied to mobile phone and to avoid any power loss. To ensure the charge flowing, ohms law can be applied. When current starts flowing through resistor it will flow in milliamperes. At the test current pin it checks the amount of voltage passing to mobile. The test current pin is directly connected to microcontroller pin no 3. Microcontroller will share information about how much voltage is received and passed to mobile phone for charging purpose.

These are 2 features added at receiving circuit, rest part is same as transmitting circuit.

Advantages over the traditional model:

By using electricity, the handset is typically charged these days, generated and supplied from various power stations. But to charge a phone, this proposed device does not need any connexion to this form of traditional power source. The handset will be charged by solar energy. So, to charge a phone's battery, additional electricity is no longer needed. Moreover, for charging, this wireless system does not need any wire to connect to the device. The handset just needs to fall on the charging dock and things start to work without anything needing to be plugged into the phone. This is considerably simpler than the conventional wired charging technique. Therefore, it is no longer appropriate to plug and unplug a cable to charge a phone at all times.

Limitation of the system:

As we know, in today's world, nothing is flawless and long lasting. For wireless charging, the same goes. One of the key reasons behind the failure of extended long distances wireless charging. It is also important to connect the charging transmitter to a power source so that we cannot be pushed anywhere. The same cannot be achieved by those wireless chargers like

conventional charging, the level of efficiency, so the method tends to be slower. Since our project is solar-based, it is sometimes very difficult to generate sufficient power as required. Furthermore, with the traditional charging method, the heat generation of wireless charging technologies is generally higher.

Future Scope:

The portable solar charger is essentially designed to charge the mobile battery. With the advent of wireless extended distance charging, it is possible to charge the equipment by walking on the street outside. Similar to a Wi-Fi hotspot, it will function like a hotspot location, the system gets charged as users walk or talk. Wireless charging now will allow the vehicles to power up. There will be no connectors or charging cables used by this wireless charging vehicle. Drivers use a wireless energy source to park their electric vehicles. The device then automatically transfers power to the vehicle's battery charger. For wireless charging vehicles, these high-rate electrochemical batteries can be used. So vehicles can be paid within very short periods of time.

IV. CONCLUSION

The concept of wireless power transmission through renewable power generation is presented. Mainly focused on providing clean and efficient power transmission through wireless medium, this would offer a major advancement in the field of solar and wireless technology. And successfully charged the mobile phone via solar power. The main Aim was to transfer power wirelessly which is successful achieved. Wireless technology is something that should be used in order to avoid mess of wire in circuits. For several portable devices, such as cell phones and other wireless applications, this wireless charging system is suitable. This research is focused on solar Wireless Infrastructure and Electricity. So electronic devices can be easily charged without any wire and battery during load shedding and travelling. Actually, this device is very powerful and reliable.

REFERENCES

[1] S. Pawade, T. Nimje, and D. Diwase, “Goodbye wires: Approach to wireless power transmission”, Int. J. Emerging Technol. and Adv. Eng., vol. 2, issue 4, pp. 382-387, Apr. 2012.

[2] L. Xie, Y. Shi, Y. Hou, and H. Sherali, "Making sensor networks immortal: An energy-renewal approach with wireless power transfer", IEEE/ACM Trans. on Networking, vol. 20, no. 6, pp. 1748-1761, 2012. Available: 10.1109/tnet.2012.2185831.

[3] L. Xie, Y. Shi, Y. Hou, W. Lou, and H. Sherali, "On traveling path and related problems for a mobile station in a rechargeable sensor network", Proceedings of the fourteenth ACM international symposium on Mobile ad hoc networking and computing - MobiHoc '13, 2013. Available: 10.1145/2491288.2491291.

[4] S. Shilpa, H. M. Manasa, S. S. Mariam, and M. K. Kumar M, “Wireless battery charger”, Int. J. Eng. Trends and Technol., vol. 35, no. 3, pp. 125-128, May 2016

[5] Global Market Revenue for Wireless Charging to Rise by Nearly Factor of 40 by 2018,.IHS, March 13, 2014 .

[6] Wireless power for mobile devices market to reach $5 billion by 2020, Information Age, 16 November 2014

This page is kept blank intentionally

Phishing Website Detection Using Machine Learning

Gaurang Pandit
Electronics & Telecommunication Department
Thakur College of Engineering & Technology
Mumbai,India.

Dr. Lochan Jolly
Professor
Electronics & Telecommunication Department
Thakur College of Engineering & Technology
Mumbai,India.

***Abstract*—Damage done due to attacks caused by phishing is becoming a challenge day by day. Phishing involves sending an email to a user or inducing a phishing page to steal a user's personal information. This type of attack can be detected by blacklist-based detection techniques; however, these methods have some disadvantages and the numbers of victims have therefore continued to increase. In this paper, we propose a heuristic-based phishing detection technique that uses uniform resource locator (URL) features. We identified features that phishing site URLs contain. The proposed method employs those features for phishing detection. The technique was evaluated with a dataset of 3,000 phishing site URLs and 3,000 legitimate site URLs. The results demonstrate that the proposed technique can detect more than 98.23% of phishing sites**.

Keywords—phishing sites, URL-based features, heuristic, machine learning

I. Introduction

With the recent growth of the Internet environment and diversification of available web services, web attacks have increased in quantity and advanced in quality. Phishing is a type of social engineering attack that targets a user's sensitive information through a phony website that appears similar to a legitimate site, or by sending a phishing email [1]. According to research of the Anti Phishing Working Group (APWG), 85,062 phishing sites were globally detected in the second quarter of 2010; by the second quarter of 2014, 128,978 were detected. These figures mark an increase of 1.5 times the value that count of occurred phishing attack in one quarter [2,3]. In addition, annual damage caused by phishing was measured at $5.9 billion. Thus, phishing is a worldwide malicious activity that continues to increase.

In response to this increase in phishing attacks, phishing detection techniques have been the focus of considerable research. Typical phishing detection techniques include the blacklist-based detection method and the heuristic-based technique. The blacklist-based technique maintains a uniform resource locator (URL) list of sites that are classified as phishing sites; if a page requested by a user is present in that list, the connection is blocked [4]. This technique is commonly used and has a low false-positive rate; however, its accuracy is determined by the quality of the list that is maintained. Consequently, it has the disadvantage of being unable to detect temporary phishing sites [5].

The heuristic-based detection technique analyzes and extracts phishing site features and detects phishing sites using that information [6]. In this paper, we propose a new heuristic-based phishing detection technique that resolves the limitation of the blacklist-based technique. We implemented the proposed technique and conducted an experimental performance evaluation. The proposed technique extracts features in URLs of user-requested pages and applies those features to determine whether a requested site is a phishing site. This technique can detect phishing sites that cannot be detected by blacklist-based techniques; therefore, it can help reduce damage caused by phishing attacks.

II. Related Works

Phishing is an attempt to steal a user's personal information typically through a fraudulent email or website [1]. We conducted a study on phishing sites, which are either fake sites that are designed to appear similar to legitimate sites or sites that simply have phishing-related behaviors. Almost all phishing sites include the functionality in which users enter sensitive information, such as their personal identification, password, and/or account number. These sites can include links to connect to other phishing sites and malicious code that contaminates a user's computer.

Phishing detection techniques can be generally divided into blacklist-based and heuristic-based approaches. The blacklist-based approach maintains a database list of addresses (URLs) of sites that are classified as malicious. If a user requests a site that is included in this list, the connection is blocked [4]. The blacklist-based approach has the advantages of easy implementation and a low false- positive rate; however, it cannot detect phishing sites that are not listed in the database, including temporarily sites [5].

The heuristic-based approach analyzes phishing site features and generates a classifier using those features [6]. When a user requests a web page, the classifier determines whether that page is a phishing site. This approach can detect new phishing sites and temporary phishing sites because it extracts features from the requested web page. Nevertheless, it has the disadvantage of being difficult to implement; moreover, generating a classifier is time- intensive. Thus, the two approaches have both advantages and disadvantages. Therefore, these approaches are selectively employed in the proposed technique depending on the application.

III. Proposed Approach

A. URL Structure

A URL is a protocol that is used to indicate the location of data on a network. The URL is composed of the protocol,

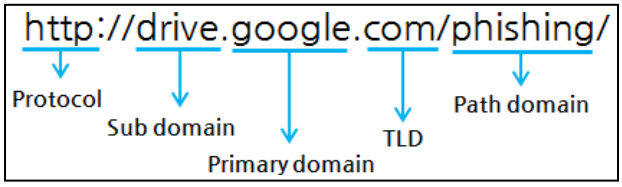


Figure 1. URL Structure.

subdomain, primary domain, top-level domain (TLD), and path domain. [6]. In this study, the subdomain, primary domain, and TLD are collectively referred to as the domain. Fig. 1 depicts the individual components of a URL.

The protocol refers to a communication protocol for exchanging information between information devices; e.g., HTTP, FTP, HTTPS, etc. Protocols are of various types and are used in accordance with the desired communication method.

The subdomain is an ancillary domain given to the domain and has various types depending on the services provided by the domain page. The domain is the name given to the real Internet Protocol (IP) address through the Domain Name System (DNS). The primary domain is the most important part of a domain. The TLD is the domain in the highest position in the domain name hierarchy architecture; e.g., .com, .net, .kr, .jp, etc. [7]. We define features of each component of the URL; these features are used for phishing site detection.

B. URL Features

Table 1 shows 26 URL-based features that are used in the proposed detection technique.

- Features 1 to 6 are mainly in connection to google sugestion. They return a suggested word when a user enters a single term. We analyze the results of Google Suggestion when entering the URLs of phishing sites and legitimate sites. If a search term is similar to a suggested result, input URL is doubtful because that site may be emulating an existing site. We use Levenshtein distance between the two terms—the Google Suggestion result and the search term—as a feature for detecting phishing sites [6,8]. In addition, if a suggested result is the same as that of a domain that is present in the trustworthy whitelist, that search term site may be emulating a legitimate site [8]. For this reason, we can detect phishing sites using this feature.

- Features 7 to 9 can be extracted through page ranking. The page rank is a numerical value that is calculated by the number of visitors and degree of popularity. Phishing sites have a very low page rank value or no value because phishing sites are not often visited by many people and they exist for a short time [9]. Therefore, if a domain page rank value is very low, it can be regarded as a phishing site.

- Features 10 are associated with suspicious URL patterns and characters. Characters such as _@‘ and _//‘ rarely appear in a URL. Moreover, URLs of legitimate sites typically have one TLD. Therefore, patterns of many TLDs in a URL signify a fraudulent site [10]. Therefore, in the above cases, we classify these sites as phishing sites.

TABLE I. URL-BASED FEATURES.

No.	URL-based features	
	Feature name	***Description***
1	Similarity of primary domain and Google Suggestion (primary domain)	Levenshtein distance between primary domain and Google Suggestion (primary domain)
2	Similarity of subdomain and Google Suggestion (subdomain)	Levenshtein distance between primary domain and Google Suggestion (subdomain)
3	Similarity of path domain and Google Suggestion (path domain)	Levenshtein distance between primary domain and Google Suggestion (path domain)
4	Safety of Google Suggestion (primary domain)	Whether result of Google Suggestion (primary domain) is present in the whitelist
5	Safety of Google Suggestion (subdomain)	Whether result of Google Suggestion (subdomain) is present in the whitelist
6	Safety of Google Suggestion (path domain)	Whether result of Google Suggestion (path domain) is present in the whitelist

7	Google page rank	PageRank value of domain
8	Alexa rank	AlexaRank value of domain
9	Alexa reputation	Alexa reputation value of domain
10	Via IP address	Whether domain is in the form of an IP address

Thus, many URL features exist that have been employed in several studies on phishing detection. In the present research, we incorporate features used in previous studies and define two new features for identifying existing phishing sites

As noted above, our proposed method employs new features that have not been previously used in studies. IN addition, it advances features from previous works to provide better phishing detection performance.

If IP address present in URL then the feature is set to 1 else set to 0. Most of the benign sites do not use IP address as an URL to download a webpage. Use of IP address in URL indicates that attacker is trying to steal sensitive information. Presence of @ symbol in URL: If @ symbol present in URL then the feature is set to 1 else set to 0. Phishers add special symbol @ in the URL leads the browser to ignore everything preceding the "@" symbol and the real address often follows the "@" symbol .Number of dots in Hostname: Phishing URLs have many dots in URL. For example http://shop.fun.amazon.phishing.com, in this URL phishing.com is an actual domain name, whereas use of "amazon" word is to trick users to click on it. Average number of dots in benign URLs is 3. If the number of dots in URL is more less set to 1 else it is generally to 0. If domain name separated by dash (-) symbol then feature is set to 1 else to 0. The dash symbol is rarely used in legitimate URLs. Phishers add dash symbol (-) to the domain name so that users feel that they are dealing with a legitimate webpage. For example Actual site is http://www.onlineamazon.com but phisher can create another fake website like http://www.online-amazon.com to confuse the innocent users.URL redirection: If "//" present in URL path then feature is set to 1 else to 0. The existence of "//" within the URL.

C. Architecture

Fig. 2 illustrates the proposed phishing detection process, which includes two phases: training and detection.

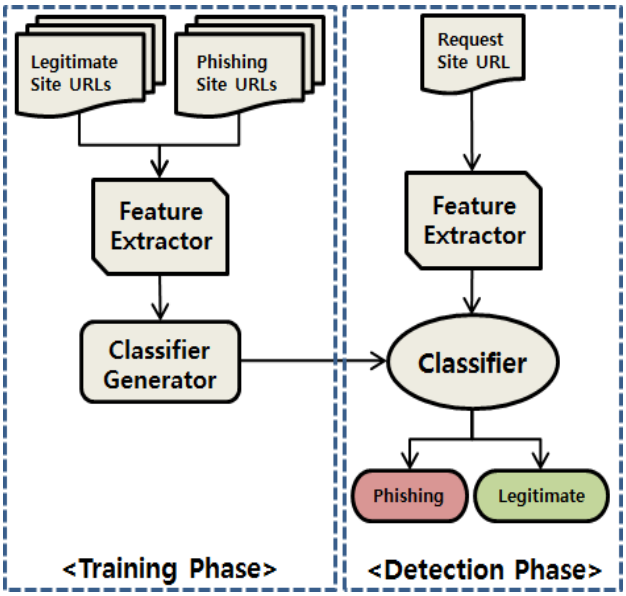


Figure 2. Process of proposed detection method.

In the training phase, a classifier is generated using URLs of phishing sites and legitimate sites collected in

advance. The collected URLs are transmitted to the feature extractor, which extracts feature values through the predefined URL-based features. The extracted features are stored as input and passed to the classifier generator, which generates a classifier by using the input features and the machine learning algorithm.

In the detection phase, the classifier determines whether a requested site is a phishing site. When a page request occurs, the URL of the requested site is transmitted to the feature extractor, which extracts the feature values through the predefined URL-based features. Those feature values are inputted to the classifier. The classifier determines whether a new site is a phishing site based on learned information. It then alerts the page-requesting user about the classification result.

D. Algorithms

To determine a classifier with the best performance for using URL-based features, we employed several machine learning algorithms: support vector machine (SVM), naive Bayes, decision tree, k-nearest neighbor (KNN), random tree, and random forest.

- SVM is a classification method that was introduced in 1992 by Boser, Gyon, and Vapnik. It is a statistical learning algorithm that classifies samples using a subset of the training samples, called support vectors. SVM is built on the structural risk minimization principle for seeking a decision surface that can separate data points into two classes with a minimal margin between them []. The advantage of SVM is its capability

of learning in spare high-dimensional spaces with very few training samples. Support vector

machine is another powerful algorithm in machine learning technology. In support vector machine algorithm each data item is plotted as a point in n-dimensional space and support vector machine algorithm constructs separating line for classification of two classes, this separating line is well known as hyperplane. Support vector machine seeks for the closest points called as support vectors and once it finds the closest point it draws a line connecting to them. Support vector machine then construct separating line which bisects and perpendicular to the connecting line.

• Decision tree is a classification method that was introduced in 1992 by Quinlan. It creates a tree form for classifying samples. Each internal node of the tree corresponds to a feature, and the edges from the node separate the data based on the value of the feature . Decision tree includes a decision area and leaf node. The decision area checks the condition of the samples and separates them into each leaf node or the next decision area. The decision tree is very fast and easy to implement; however, it has the risk of over fitting. Creation of trees are based on bootstrap method. In bootstrap method features and samples of dataset are randomly selected with replacement to construct single tree. Among randomly selected features, random forest algorithm will choose best splitter for the classification and like decision tree algorithm; Random forest algorithm also uses gini index and information gain methods to find the best splitter. This process will get continue until random forest creates n number of trees.

• Random forest is a classification method that combines many tree predictors; each tree depends on the values of a random vector that is independently sampled. All trees in the forest have the same distribution. This algorithm can handle a large number of variables in the dataset; however, it lacks reproducibility because the process of forest building is random. Random forest algorithm is one of the most powerful algorithms in machine learning technology and it is based on concept of decision tree algorithm.

• Random forest algorithm creates the forest with number of decision tree which have implemented in the proposed system. Each tree in forest predicts the target value and then algorithm will calculate the votes for each predicted target. Finally random forest algorithm considers high voted predicted target as a final prediction. Phishers can make a use of Unicode characters in URL to trick users to click on it. For example the domain “xn--80ak6aa92e.com” is equivalent to "apple.com". Visible URL to user is "apple.com" but after clicking on this URL, user will visit to “xn--80ak6aa92e.com” which is a phishing site. :

The existence of HTTPS is very important in giving the impression of website legitimacy . But minimum age of the SSL certificate of benign website is between 1 year to 2 year.URL of Anchor: We have extracted this feature by crawling the source code oh the URL. URL of the anchor is defined by the tag.

IV. Evaluation

To conduct classifier training and evaluation through an experimental dataset, we collected the URLs of phishing and legitimate sites. We gathered 3,000 phishing site URLs from PhishTank and 3,000 legitimate site URLs from DMOZ. The evaluation was conducted using k-fold cross validation. K-fold cross validation divides the input data into k; k – 1 datasets are used for training, and the remaining one is used for validation. This process is performed k times, such as the number in the divided dataset, because all datasets can be used for training and validation. This method is typically used to evaluate the accuracy of the classifier with a small dataset. In this study, we used ten-fold cross validation to evaluate our detection technique. We performed the testing with the WEKA open-source machine learning tool, and we analyzed the performance of each of the machine learning algorithms noted in Section 3. The accuracy was calculated as TP (true positive), TN (true negative), FP (false positive), and FN (false negative). We compared the performance of each classifier using the calculated accuracy. Fig. 3 depicts the TP, TN, FP, and FN matrix.

		Prediction	
		Positive	Negative
Actual	True	*True Positive*	*False Negative*
	False	*False Positive*	*True Negative*

Figure 3. TP, TN, FP, FN matrix

TP is the ratio of the prediction that a determined phishing site is indeed a phishing site, and FN is the ratio of the prediction that a determined phishing site is actually a legitimate site. In addition, FP is the ratio of the prediction that a truly legitimate site is a phishing site, and TN is the ratio of prediction that a determined legitimate site is indeed a legitimate site. Table 2 shows the TP, TN, FP, FN ratios of each machine learning algorithm.

As a result of the experiments, we obtained TP, TN, FP, and FN ratios to calculate three measurements that we used to compare the performance of each algorithm. The first measurement was for the specificity of the true negative rate. The second was the sensitivity of the true positive rate. The third was the accuracy of the total ratio of the prediction that a determined phishing site is actually a phishing site, and that a determined legitimate site is indeed legitimate

In measuring the classifier performance, (1) was the equation of specificity, (2) was the equation of sensitivity, and (3) was the equation of accuracy.

$$Specificity=\frac{TP}{TP+FP} \quad (1)$$

$$Sensitivity=\frac{FP}{FP+FN} \quad (2)$$

$$Accuracy=\frac{TP+TN+FP+FN}{TP+TN} \quad (3)$$

TABLE II. TF, TN, FP, AND FN OF MACHINE LEARNING ALGORITHMS

Algorithm	Measurements			
	TP	***TN***	***FP***	***FN***
SVM	97.00 %	94.90 %	5.10%	3.00%
Decision Tree	96.90 %	96.90 %	3.10%	3.10%
Random Forest	98.10 %	98.40 %	1.60%	1.90%

We additionally used the specificity, sensitivity, and accuracy as measurements of the classifier performance measurement. Table 3 shows the specificity, sensitivity, and accuracy of each machine learning algorithm that we used in training.

TABLE III. EXPERIMENTAL RESULTS OF ALGORITHMS

Algorithm	Measurements		
	Specificity	***Sensitivity***	***Accuracy***
SVM	96.93%	95.00%	95.95%
Decision Tree	96.90%	96.90%	96.88%
Random Forest	98.10%	98.30%	98.23%

As a result of the experiment, we determined that the best machine learning algorithm, random forest, used URL features. This classifier detected more than 98.23% of phishing sites. The high accuracy shown in Table 3 and low false-positive rate shown in Table 2 meant that the proposed phishing detection technique can effectively classify sites as either being phishing or legitimate..

V. Conclusion

In this paper, we proposed a heuristic-based phishing detection technique that employs URL-based features. The method combines URL-based features used in previous studies with new features by analyzing phishing site URLs. Additionally, we generated classifiers through several machine learning algorithms and determined that the best classifier was random forest. It showed a high accuracy of 98.23% and a low false-positive rate. The proposed technique can provide security for personal information and reduce damage caused by phishing attacks because it can detect new and temporary phishing sites that evade existing phishing detection techniques, such as the blacklist-based technique.

In future work, we intend reduce the time consumed while using the current method which we used in this paper. It will help reduce the time consumed as well as help us extract more features which can help us in providing more better accuracy set and help us in a better way to reduce phishing attacks which are being used by hackers in today's world.we can use more modern approaches to reduce the phishing attacks rather than going by the conventional method of approaching, tracking and reducing these phishing attacks. With more better algorithm approaches the feature extraction can be enhanced

REFERENCES

[1] Khonji, Mahmoud, Youssef Iraqi, and Andrew Jones. "Phishing detection: a literature survey." Communications Surveys & Tutorials, IEEE 15.4 (2013): 2091-2121.

[2] Anti Phishing Working Group. (2015. March.) APWG Phishing Activity Trend Report 2nd Quarter 2010. [Online]. Available: http://docs.apwg.org/reports/apwg_trends_report_q2_2014.pdf

[3] Anti Phishing Working Group. (2015. March.) APWG Phishing Activity Trend Report 2nd Quarter 2014. [Online]. Available: http://docs.apwg.org/reports/apwg_report_q2_2010.pdf

[4] Huang, Huajun, Junshan Tan, and Lingxi Liu. "Countermeasure techniques for deceptive phishing attack." New Trends in Information and Service Science, 2009. NISS'09. International Conference on. IEEE, 2009.

[5] Ma, Justin, et al. "Beyond blacklists: learning to detect malicious web sites from suspicious URLs." Proceedings of the 15th ACM SIGKDD international conference on Knowledge discovery and data mining.

ACM, 2009

[6] Nguyen, Luong Anh Tuan, et al. "A novel approach for phishing detection using URL-based heuristic." Computing, Management and Telecommunications (ComManTel), 2014 International Conference on. IEEE, 2014.

[7] Wikipedia. (2015. March) Uniform Resource Loactor. Avaliable: http://en.wikipedia.org/wiki/Uniform_resource_locator

[8] Kausar, Firdous, et al. "Hybrid Client Side Phishing Websites Detection Approach." International Journal of Advanced Computer Science and Applications (IJACSA) 5.7 (2014).

[9] Sunil, A. Naga Venkata, and Anjali Sardana. "A pagerank based detection technique for phishing web sites." Computers & Informatics (ISCI), 2012 IEEE Symposium on. IEEE, 2012.

[10] Mohammad, Rami M., Fadi Thabtah, and Lee McCluskey. "Intelligent rule-based phishing websites classification." Information Security, IET 8.3 (2014): 153-160.

This page is kept blank intentionally

IoT Based Smart Home Automation System Using ARM7 LPC2148 & GSM/GPRS

Priya Khillare
Electronics & Telecommunication Engineering Department
Terna Engineering college,
Navi Mumbai India.
priyakhillare07@gmail.com

Dr. L. K. Ragha
Electronics & Telecommunication Engineering Department
Terna Engineering college,
Navi Mumbai India.
lkragha@ternaengg.ac.in

***Abstract*—The idea behind home automation is to have greater security, make people's life easier and comfortable. In today's life IoT plays vital role in automation, which offer people to control home appliances in proficient manner over internet by using the advanced communication technologies and automation system. The innovation in electrical appliances industry that has introduced a GPRS-enabled based home appliances in a market, which subsequently offers an alternative for implementing the automated smart home system at reasonable cost. Considering the Energy management, security benefits of IoT, we have designed IoT based collaborative affordable home automation and data gathering system to display the data on web page using internet via GPRS. The proposed system uses GSM or GPRS technology for controlling, monitoring home appliances & atmosphere. The prototype is been implemented on ARM LPC2148 controller board, Relays, Bulbs, Motor, Sensors and Embedded C.**

Keywords—HA, ARM LPC2148 Controller, GSM/GPRS, Embedded C Language

I. INTRODUCTION

The concept of IoT is used to interface all the appliances and sensing devices to the internet and allow them to communicate with each other over the internet. With IoT, all the objects extended through internet around us can communicate resulting in enhanced competence, accuracy and monetary benefit [10 ,11]. Home automation system provides automatic control and monitoring of electrical or electronic home appliances with minimal human intervention, which provides better security and more efficient use of energy. The main characteristics of home automation are automation and remote control and process involves controlling of electrical and electronic home appliances automatically using various control system techniques through internet [9-11]. In addition to that, the modern homes are automated through the internet and the home appliances are controlled. Usually it consists of sensing element, which collect different kind of data like temperature, smoke, light intensity etc. controlling unit controls the appliances by analyzing the gathered data. The exchange of data and user commands over the internet can be obtained by the communication technologies GSM/GPRS, Wi-Fi, Bluetooth etc [2,12-14]. The core objective of this paper is to build a affordable smart home system, that can be used to control the home appliances, monitor gas, temperature, light via GSM/GPRS. The collected parameters through various sensors is analyzed by ARM7 LPC2148 controller and then transmitted over internet. GSM/GPRS module interfaced with ARM7 LPC2148 controller board is used to provide the wireless communication interface with internet [2,12-13].

Fig. 1. Smart Home

II. LITERATURE SURVEY

One of the researchers, established smart home system using Arduino microcontroller, WI-FI module EP8266 and Android-Based smartphone [1]. The home machines and the sensing devices are interfaced with I/O pins of Arduino controller. The purpose of Arduino board is to measure & collect the readings from the sensors. A local controlling done through Wi-Fi whereas the remote controlling is done over IoT. Virtuino android application is used to monitor & control the home appliances via android base mobile phone.

Another researcher set the automation system with Node MCU as main controller integrated with Node MCU EP8266 [2]. The Node MCU is used for collecting the sensors data however the Node MCU EP8266 is used to connect to internet by using the IP address so, system can be controlled through Wi-Fi.

There is publication on proposed smart home system which consist of STM32F407VGT6 microprocessor is used to control the home appliances and monitor the environmental conditions and SIM800A is used for wireless transmission for sensor data and command information [3].

There is a design of the Home Automation System using Raspberry Pi to monitor and control
home appliances such as light, fan etc and also alarm indication for hazardous condition [4].
There is a proposed home automation system using Bluetooth technologies for controlling the Home Appliances. Handler can use the cell phone to control the home appliances. The only drawbacks of using Bluetooth technology is that it operate over a short range [5].
There is another related work using the GPRS. SMS & Email services used to alert, control & monitor the electrical appliances [6].

III. Shortcoming Of Existing System

- The Drawbacks of Bluetooth in home automation
  Limited to Short distance
  Data Rate is low
- Home Automation System using Raspberry-pi is high since the Raspberry-pi device cost is comparatively high
- Smart Home System using the Arduino have less processing & high operating voltage.
- Multitasking is not supported in Arduino.

IV. Propsed System Work

The proposed block diagram explains the working modules

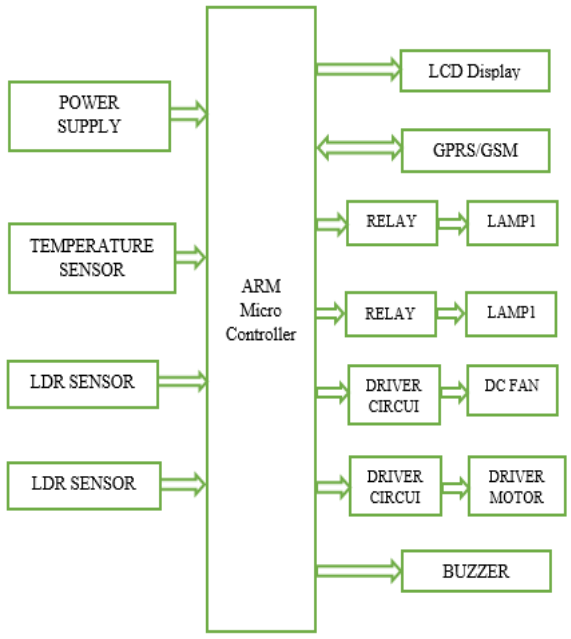


Fig.2 The Complete System Flow

A. System Details

This proposed system includes
1) Sensor: In this design different kinds of sensors are used to get the physical condition, like temperature sensor is used detect the temperature value, gas sensor is used to detect the smoke, LDR sensor is used to evaluate the light intensity. The microcontroller will receive this sensor information and will send over GPRS to display over GUI. A relay switch used to send a control signal received from the microcontroller to electronic devices to perform the switching action i.e ON and OFF.

2) Microcontroller: ARM7 microcontroller programmed in way that, it will serves as the centre of all systems and regulates all activities.
3) Remote Operation: For this GSM/GPRS module and the SIM 800L GSM/GPRS modem are used.

V. System Design

A. Conceptual Framework

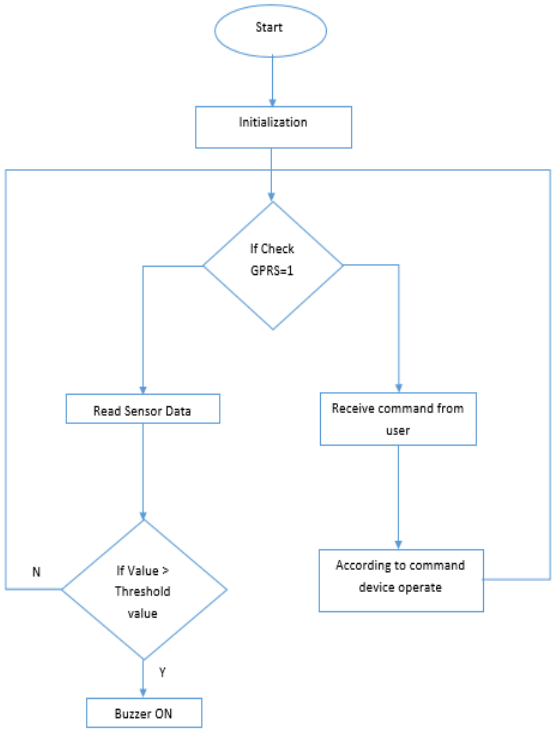


Fig.3 The Complete System Flow

The flowchart from the Figure.3 shows the entire home automation system. After powering on the system, SIM800L module get initialized and login automatically. After initialization system start collecting the sensor data and matching with the defined threshold. If value crosses the defined threshold then the buzzer alarm will be triggered. And also, system will accept the user command and will act accordingly like turn on the bulb/A.C etc.

VI. Hardware Descriprtion

Major hardware component for these proposed systems is ARM7 LPC2148 microcontroller which is used for controlling the functions and second one is SIM800L used for GPRS transmission.

A. ARM7 Microcontroller

ARM is a 32-bit Advanced Risc Machine, particularly used for high-end application & mostly found in robotic application.
The LPC2148 specifically a 16 bit or 32 bit ARM7 based microcontroller and available in a small LQFP64 package. It has static on chip RAM of 8 kB to 40 kB and has on chip non-volatile memory of 32 kB to 512 kB. It has 128-bit wide interface/accelerator enables high-speed 60 MHz operation. Many serial interfaces like two 16C550 UARTs, It has two I2C-buses which have a speed of 400 kbit/s.

Fig.4 ARM7 LPC2148 Board

B. SIM800L(GSM/GPRS)

SIM800L used as cellular unit which enables GPRS transmission, sending and receiving SMS and allowing and receiving voice calls. SIM800L is low cost and support quad-band 850/900/1800/1900MHz.
Considering the features & specification, this module is unique for the project where long range connectivity needed. After connecting SIM800L module to supply unit, it came up & login to the cellular network automatically. LED status of SIM800L indicate the connection state (If there is no network then LED blink very fast and if there is network coverage then LED blinking slowly). SIM800L unit encompassed with two antennas. First the wire antenna solders to NET pin on PCB which is very useful in narrow places. Second - PCB antenna with double sided tape and attached pigtail cable with IPX connector. SIM800L has greater performance and due to small in size which fit in small place.

Fig. 5. ARM7 LPC2148 Board

Fig. 6. The proposed system architecture

VII. WORKING SETUP

This interconnectivity allows them to create a system that can monitor, analyse, control, and automate. In this prototype, we have connected the load to ARM7 LPC2148 board through relay and DC Driver circuitry. The ARM7 LPC2148 board is used to gather the data from the sensing node (sensors) and send this gathered information from sensing node (sensor) to the web site by using the GPRS

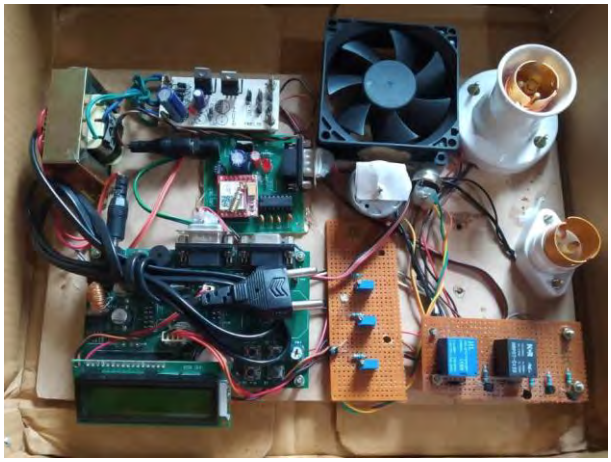


Fig. 7. Implementation of home automation system based on ARM7 LPC2148 Board

VIII. EXPERIMENT RESULT AND OBSERVATION

The microcontroller within the coordinator unit uses to gather the info from sensing node and send the knowledge data to the online site by using GPRS. Fig.8 shows the representation of status of home appliances & the sensed data on web site.

Fig. 8. Result of sensors & Appliance status

In addition to that homeowner has a privilege to control home appliances such as light, conditional system via Short Message Service (SMS) by using GSM.

IX. CONCLUSION

This paper summarizes the development of Home Automation System using ARM7 LPC2148 board & GPRS/GSM. Our main objective is to develop the cost effective "IoT based Home Automation System" to enable automating the majority of electronic, electrical and technology-based tasks within a home to provide ease to the people to regulate their home appliances. Implemented prototype enabled the monitoring & controlling of home electronic & electrical devices using IoT concept. Hence the cost effective "IoT based Smart Home Automation System Using ARM7 LPC2148 & GSM/GPRS" has been successfully designed and tested. The next scope of our work will be connecting the more number of devices and various type of sensors as ARM7

LPC2148 have more number I/P pin comparative to other microcontroller such as Arduino, Raspberry Pi (B+) for enhancing safety, security and insure fully-automated of home appliances for better user experience.

REFERENCES

[1] Waheb A. Jabbar, Mohammed Hayyan Alsibai, Nur Syaira S. Amran, and Samiah K. Mahayadin "Design and Implementation of IoTBased Automation System for Smart Home" 2018 International Symposium on Networks, Computers and Communications (ISNCC) Year: 2018 | Conference Paper | Publisher: IEEE

[2] Himanshu Singh, Vedant Khandelwal, Vishal Pallagani and Venkanna "IoT based Smart Home Automation System using Sensor Node" 2018 RAIT, Forth International Conf. on Recent Advances in Information Technology

[3] Zhang Xiaodong, Zhang Jie "Design and Implementation of Smart Home Control System Based on STM32" 2018 Chinese Control And Decision Conference (CCDC)

[4] Ms. Ashwini Pawar and Prof. V. M. Umale "Review On: Home Automation Based Upon Internet of Things" April 2018 4th International Conference on Computing Communication Control and Automation (ICCUBEA)

[5] Dheeraj Sunhera and Veena M, "Implimentation of Interactive Home Automation Syatem Based On Email and Bluetooth Technologies" 2015 International Conference on Information Processing (ICIP)

[6] Gaurav Tiwari, Riyaz Kazi "IoT based Interactive Industrial Home wireless system, Energy management system and embedded data acquisition system to display on web page using GPRS, SMS & E-mail alert" 2015 International Conference on Energy Systems and Applications (ICESA 2015)

[7] Parag Biswas, Mehedi Hasan and MD Toufiqul, Islam Bilash "Smart Home Systems: Overview and Comparative Analysis" 2018 4th International Conference on Research in Computational Intelligence and Communication Networks

[8] Majid Al-Kuwari, Abdulrhman Ramadan, Yousef Ismael, Laith Al-Sughair and Adel Gastli "Smart-Home Automation using IoT-based Sensing and Monitoring Platform" 2018 12th IEEE International Conference on Compatibility, Power Electronics and Power Engineering.

[9] Bhavna and Dr. Neetu Sharma2 "SMART HOME AUTOMATION USING IOT" International Journal of Engineering Sciences & Research Technology May, 2018, ISSN: 2277-9655, CODEN: IJESS7

[10] Wireless Home Automation [Online], Available : https://www.elprocus.com/wireless-home-automation-using-internet-ofthings

[11] Divyashree, M., & Rangaraju, H. G. "Internet of Things (IoT): A Survey" 2018 International Conference on Networking, Embedded and Wireless Systems (ICNEWS)

[12] Al-Sarawi S, Anbar M, Alieyan K, & Alzubaidi M "Internet of Things (IoT) communication protocols: Review" 2017 8th International Conference on Information Technology (ICIT)

[13] Porkodi, R., & Bhuvaneswari, V. "The Internet of Things (IoT) Applications and Communication Enabling Technology Standards: An Overview". 2014 International Conference on Intelligent Computing Applications

[14] Ronik Dhakar "Comparison of Various Technologies for Home Automation System" May 2017 International Journal of Research and Scientific Innovation (IJRSI) | Volume IV, Issue V "Biometrics Deployment of Machine-Readable Travel Documents", Version 2.0, May 2004.

A Contactless Passport Verification System at Airports Using RFID Technology

Vinit P. Kharkar
Department of Electronics & Telecommunication Engineering Prof Ram Meghe College of Engineering & Management, Badnera Amravati (MS), India.
vinit.kharkar@prmceam.ac.in

Ajay P. Thakare
Department of Electronics & Telecommunication
Engineering Prof Ram Meghe College of Engineering & Management, Badnera Amravati (MS), India.
apthakare40@rediffmail.com

***Abstract*—In the current situation of covid-19 pandemic, the entire world is looking towards engineering and technology field for contactless applications. One of such solution is provided in this paper for contactless verification of passport at airport terminals. The novel passport verification system described in paper termed as E-passport system which also helps to restrict attempts of illegal immigration across country borders. The proposed system makes use of Radio Frequency Identification (RFID) technology to achieve the contactless verification. The system also uses Arduino which is an open source electronics platform to implement the system. The main advantage of this system is to access the passport details by using RFID technology with minimal social interaction.**

Keywords—RFID, Covid-19, Passport, Arduino, RF Reader module, RF Tag

I. INTRODUCTION

Passport verification and checking is a very timeconsuming process and involves person to person interaction. According to World Health Organisation (WHO) [1], the corona virus can spread through the human to human interaction by coming in contact with infected person. Such situation may arise at airport terminals during passport verification during immigration process. The system proposed in this paper provides the solution to this unforeseen problem. This basic approach utilised in proposed system includes giving the authorized person an RFID tag which contains all the passport details like name, passport number and nationality etc. Once, the person places the cardboard ahead of the RFID card reader, it reads the info and verifies it there upon data present within the system and if it matches then it displays the small print of the passport holder. The system designed is an authentication system where the passport holder is authorized through RFID technology. All the necessary passport details like name, number, nationality etc are contained in the RFID tag available with passport holder. This tag has to be swiped over the reader and the information thus read is provided to a processing unit. This information is matched with the one stored within the database, if the info matches, it displays a confirmation message otherwise displays a denial message on LCD screen. The status of a specific person also can be obtained through a standing button within the system. Typically, Radio Frequency Identification (RFID) systems are comprising of three main components which includes tags, readers, and a database. An RFID tag may be a small device which will be attached to products and permit for unique item Identification and merchandise description. RFID tags are often battery powered (active) or powerless (passive). When an RFID tag is within communication range of an RFID reader, the reader interrogates that tag (and powers it if it's passive). Upon interrogation, the tag responds with a quantity that permits legitimate readers to access the database and perform the Identification process. If things work as planned, the reader should be able to uniquely identify the interrogated tag [7].

Fig. 1. Inside View of e-passport

II. LITERATURE SURVEY

A. Existing Technology

In 1998, the Malasiya was the first country in world to isasue a RFID based passports. Malaysian epassports record the travel history (time, date, and place) of entries

and exits from the country In addition to information also contained on the visual data page of the passport. Other countries that insert RFID in passports include Norway (2005) Japan (March 1, 2006), most EU countries (around 2006), Australia, Hong Kong, the us (2007), India (June 2008), Serbia (July 2008), Republic of Korea (August 2008), Taiwan (December 2008), Albania (January 2009), The Philippines (August 2009), Republic of Macedonia (2010), and Canada (2013). Standards for RFID passports are determined by the ICAO [9]. ICAO refers to the RFID chips in e-passports as "contactless integrated circuits". ICAO standards provide for epassports to be identifiable by a typical e-passport logo on the front cover. Since 2006, RFID tags included in new us Passports will store an equivalent information that's printed within the passport, and include a digital picture of the owner. The US Department of State initially stated the chips could only be read from a distance of 10 centimetres (3.9 in), but after widespread criticism and a transparent demonstration that special equipment can read the test passports from 10 metres (33 ft) away the passports were designed to include a skinny metal lining to form it harder for unauthorized persons to "skim" information when the passport is closed[2].

B. Related Research Work

Bhagya Wimalasiri & Neera Jeyamohan [4] presented a case study on Security of Sri Lanka's EPassport which is mainly based on two technologies: RFID and Biometrics. They propose a novel multi-stage authentication scheme that incorporates verification of data stored inside the RFID tag, watermarking, facial and signature authentication for e-passports. Information embedded within the RFID tag is first compared against the centrally stored bio-data to determine their similarity. The printed facial image and signature on the passport are compared against centrally stored items to validate their authenticity. In the case study of the U.S. e-Passport by Marci Meingast, Jennifer King, Deirdre K. Mulligan [2] discusses the reasons why the Department of State did not adequately identify and address this privacy and security risks, even after the government's process mandated a privacy impact assessment. The authors utilise the U.S. Government's adoption process for the electronic passport. The researchers presented a comprehensive case study for identifying the privacy and security risks that arise by embedding RFID technology in everyday things. Finally, they conclude with recommendations to assist government as well as industry in early identification and resolution of relevant risks posed by RFID technology embedded in everyday things. V.K. Narendira Kumar and B. Srinivasan [3] presented a research study on biometric passport represents an attempt to acknowledge and account for the presence on e-passport using biometrics recognition towards their improved identification. The authors work on biometric passport validation scheme using radio frequency identification technique and finds out that the application of facial, fingerprint, palm print and iris recognition in passports requires high accuracy rates; secure data storage, secure transfer of knowledge and reliable generation of biometric data. The also concluded that the authorities need to put faith in emerging technologies for such a crucial issue. The authors also emphasize on technological promise of biometric authentication Since an absolute identification could eliminate mismatched computer records and stolen identities.

III. System Development

The activation of a RFID chip is done by a magnetic field from a reader, after this process of initiation, it will broadcast the data that is stored in its memory. There are many concerns were raised regarding broadcasting of this personal information while application of this technology in such sensitive areas such as passports. However, the International Civil Aviation Organization (ICAO), the organization that developed the standards for electronic passports, analysed these options and excluded contact chips from use in electronic passports. While designing the passport with contact chip technology, many difficulties arises to put contact chip in a passport style document. Also, it will violate the basic motive of the implementation of this system which is to make this system a contactless in prevent from the any kind of human interaction. The contact chip technology also affects the lifespan of the passport which is normally ten years since it requires exposed areas with precise contact points for reader. Considering all this issue, an attempt has been made to implement a system for electronic passports using a contactless chip technology, such as RFID.

A. Block Diagram

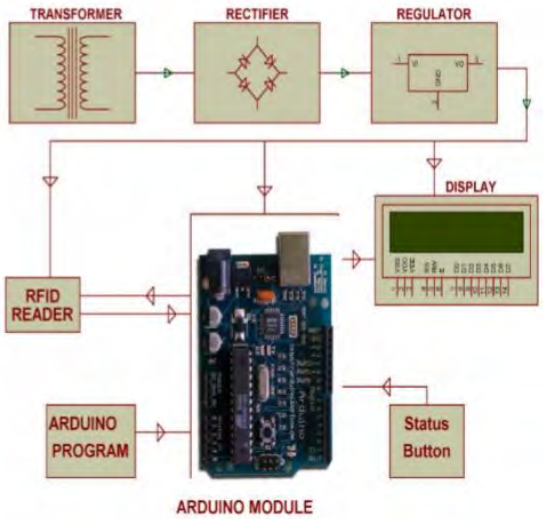


Fig. 2. Block diagram of the system

The figure 2 shows a block diagram for the proposed system. Here transformer is step down transformer which is used to bring voltage from 240V to 6V. Rectifier used is to convert AC into DC. The voltage Regulator which is employed to take care of a continuing voltage throughout and within the bounds. The passport to be scanned is placed on RFID reader and the data of the particular person is fed in the database. Here Arduino act as a central processing unit which controls all the

operation of the circuit. Status button is employed to offer the data stored within the epassport. and eventually, the small print of the passport is viewed on the liquid crystal display (LCD). For display a 16×2 LCD is employed. For providing the information to the user, The LCD display the essential messages like show tag, enter your pin, password matched or wrong password etc.

B. Circuit Diagram

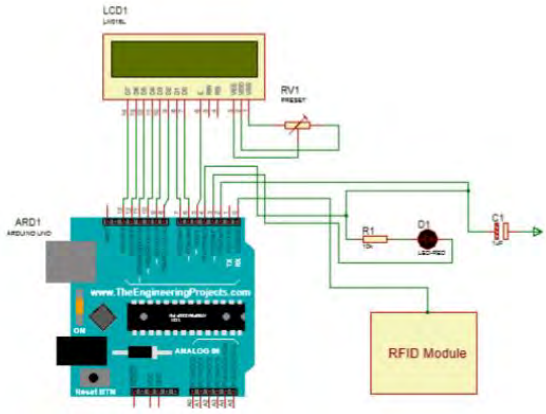


Fig. 3. Circuit Diagram

C. Major Component with specifications

a. The RFID module
RFID Reader Module, are also called as interrogators. The main function is to convert radio waves returned from the RFID tag into a form that can be passed on to Controllers, which can make use of it. For communication with each other, RFID tags and readers have to be tuned to identical frequency. RFID systems use many different frequencies, but the most common and widely used & supported by reader used in the system is 125 KHz. The specifications are as shown
− 5V DC through USB
− Current: <50mA
− Operating Frequency: 125 KHz
− Read Distance: 10cm
− Size of RFID reader module: 32×3×8 in mm.

b. Arduino

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller which is heart of this system. The Arduino board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The word "uno" means "one" in Italian and was chosen to mark the initial release of Arduino Software. The Uno board is the first in a series of USBbased Arduino boards. The specification is below
− ARDUINO ATmega 328 micro controller
− Atmel 8-bit AVR RISC-based
− 32 kB ISP flash memory
− 1 kB EEPROM, 2 kB SRAM
− 23 general purpose I/O lines
− 32 general purpose working registers,
− three flexible timers/counters
− internal and external interrupts
− serial programmable USART
− a byte-oriented 2-wire serial interface
− SPI serial port
− 6-channel 10-bit A/D converter
− 8-channels in TQFP and QFN/MLF packages
− programmable watchdog timer
− The device operates between 1.8-5.5 volts.

Fig. 4. Arduino Uno Board

c. LCD Display
Liquid crystal displays (LCDs) are a passive display technology which employed in the system to display the various message and information to the user. Being a passive device. It will not emit light instead they make the use the ambient light in the environment for their working operation. The specification is as below.
− Display Mode: STN, BLUB
− Display Format: 16 Character x 2 Line
− Viewing Direction: 6 O'clock
− Input Data: 4-Bits or 8-Bits interface
− Display Font: 5 x 8 Dots
− Power Supply: Single (5V±10%)
− Driving Scheme: 1/16Duty,1/5Bias
− Backlight (side): LED

IV. Working Of The System

To switch on the E-Passport Kit, the kit needs to be interfaced with the external power supply. The external power supply here in this proposed system will be the power provided by the USB port of the laptop. The kit is connected with the micro USB cable of the AURDIUNO. As the power is extracted the kit will initialize and shows the above image. The RF tag is punched near the RF reader module as it is an active tag it will not require any external power supply to the tags. The tag consists of 12-digit code. When the tag is punched toward the RF reader it will show the output.

Fig.5 RF Tag and RF Reader Module

To access the passport details of a passport holder through RFID technology is the main functionality of this system presented in this paper. For this purpose, E-passport with RFID card is given to the authorized person. The RFID card along with the microcontroller will perform certain operations such as storing, processing information through modulating and demodulating of the radio frequency signal that is being transmitted. Thus, the data stored in this card is nothing but the passport details of the person. After this, the details of the person would be fed into the computer which will be stored in the central database of the system and a unique number is allocated to the person that number which will be used for verification purpose. At this of verification, for validation purpose details of the RFID passport are accessed by using RFID reader. After reading, it will transmit the data wirelessly by using RF transceiver. At the receiver side, RF receiver receives the details and sends to the microcontroller for necessary actions to be perfomed.. Here, the controllers compare with the data already there. If it matches than the person is allowed. This proposed system simplifies the verification process of passport at airport terminal by giving the authorized person an RFID tag. During the process of validation, the pe ves aces the card in front of the RFID card reader. The Card reader will access the data and compares it with that data present in the system database. Upon successful matching, the system will display the details of the passport holder and will allow the entry to person. If matching fails, it will show error message indicating the mismatching between the RFID card data and information available in system database.

Fig.6 System Display

V. Conclusion

This proposed system gives expected outcome of electronic passport system for contactless verification which finds its application at airports to avoid the spread of covid-19 pandemic. It also reduces the burden of documentation as well as it reduces the time consumption. The use of open source platform, Arduino along with RFID technology make this system cost effective as well as easy to implement. RFID technology enables the government to trace and track the information of the travellers using RFID tags. The major concern for this system is security. Addition of biometric information to existing system such as palm scan, iris scan, digital signature and other active authentication in the passport system surely will increase the security of the system, but it will also increase the complexity of system and additional hardware requirement. Thus, it can be can concluded that the system presented in this paper provides a cost effective, reliable and contactless method for passport verification at airport terminals.

References

[1] https://www.who.int/news-room/detail/23-01-2020-statement-on-the-meeting-of-the-international-healthregulations-(2005)-emergency-committee-regarding-theoutbreak-of-novel-coronavirus-(2019-ncov)`

[2] Marci Meingast, Jennifer King, & Deirdre K. Mulligan, “Security and Privacy Risks of Embedded RFID in Everyday Things: the e-Passport and Beyond”, Journal of Communications, vol. 2, Issue 7, pp. 36-48, 2007.

[3] Kumar, V. K. Narendira; Srinivasan, B., “Design and Development of e-passports using Biometric Access Control System” International Journal of Advanced Smart Sensor Network Systems, Vol 2, Issue 3, pp. 51-62, July 2012.

[4] Bhagya Wimalasiri & Neera Jeyamohan, “An E-Passport System with Multi-Stage Authentication: A Case study of the Security of Sri Lanka’s E-Passport”, Global Journal of Computer Science and Technology: G Interdisciplinary, vol 18, Issue 2, 2018

[5] Shivani Kundra, Aman Dureja, Riya Bhatnagar, “The study of recent technologies used in E-passport System”, IEEE Global Humanitarian Technology Conference - South Asia Satellite (GHTC-SAS), pp 141- 146, 26-27 Sept 2014.

[6] Fadi Hamad, Jamal Zraqou, Adi Maiita, and Anas Abu Taleb, “A Secure Authentication System for ePassport Detection and Verification”, IEEE European Intelligence and Security Informatics Conference, pp 173-176, 7-9 Sept. 2015 [

[7] B. Fennani; H. Hamam; A. O. Dahmane, “RFID Overview”, IEEE ICM 2011 Proceeding, 19-22 Dec. 2011, DOI: 10.1109/ICM.2011.6177411

[8] Yusuf Abdullahi Badamasi, “The Working Principle of An Arduino”, 11th International Conference on Electronics, Computer and Computation (ICECCO), 2014, DOI: 10.1109/ICECCO.2014.6997578

[9] ICAO, “Biometrics Deployment of Machine-Readable Travel Documents”, Version 2.0, May 2004.

Home Automation Using IoT

Santosh Saw
Electronics Dept., TCET,
Mumbai, India
sawsantosh350@gmail.com

Chhayank Singh
Electronics Dept., TCET,
Mumbai, India
chhayank.singh2912@gmail.com

Sachin Tiwari
Electronics Dept., TCET,
Mumbai, India
tiwari123sachin2@gmail.com

Adarsh Sharma
Electronics Dept., TCET,
Mumbai, India
adarsh4939@gmail.com

Vishal Thakur
Electronics Dept., TCET,
Mumbai, India
vishalsanjivthakur@gmail.com

Vivek Tiwari
Electronics Dept., TCET,
Mumbai, India
tiwarivivek020801@gmail.com

***Abstract*—IOT is the upcoming revolutionary technology which can bring everlasting impact on humans. The development of the system was a difficult task due to non-availability of the resources and it is also seen how carelessly people handle the tools. The proposed system includes automating the few home appliances which can be named as Motion Sensing lights, Temperature regulated A.C., Solar light tracker and lastly the Toilet paper dispenser. The motion sensing lights' mechanism is achieved with the help of the PIR sensors. Temperature regulated A.C. will work on the mechanism of maintaining the temperature as per the user defined threshold value. Solar tracker will use the LDR for detecting the intensity of light around the solar panel. The toilet paper dispenser will work on the mechanism of a motion detector. Whole system is connected and operated with the help of a central unit i.e. Arduino UNO R3. The proposed project deals with use of IOT at homes to automate home in various ways. The system increases the simplicity and reduces the complex circuitry throughout the home.**

Keywords—Automation, IOT, Arduino, Dispenser, AC, Solar Tracker, Lights, Wi-Fi module, Graphene, Paper, Sensors, Electronics

I. Introduction

IOT also known as an Internet of Things is one of the upcoming fields in Science and technology which has the power to change and bring the everlasting impact in the life of many humans. IOT connects the various appliances with a single device using the internet. After connecting the devices, they can be operated even from a distance. Automation is not possible without the help of the IOT, automation is defined as the process in which the connecting of various appliances over the internet with less or even no human interaction takes place. Automation is categorized into various forms viz. Industrial automation, Home automation, Building automation etc. The complexity in the usage of the various home appliances has significantly reduced with the help of the automation. The day to day used manual systems are now being replaced with the automatic system. The project is about the home automation which is been achieved with the help of IOT or the Internet of things. Automation in simple terms can be defined as the process in which the controlling and monitoring of regularly used home appliances using various techniques which can be named as e-mail, Bluetooth, World Wide web etc. Electronics appliances such as Fridge, Television, lights, fans etc. are automated under the process of home automation.

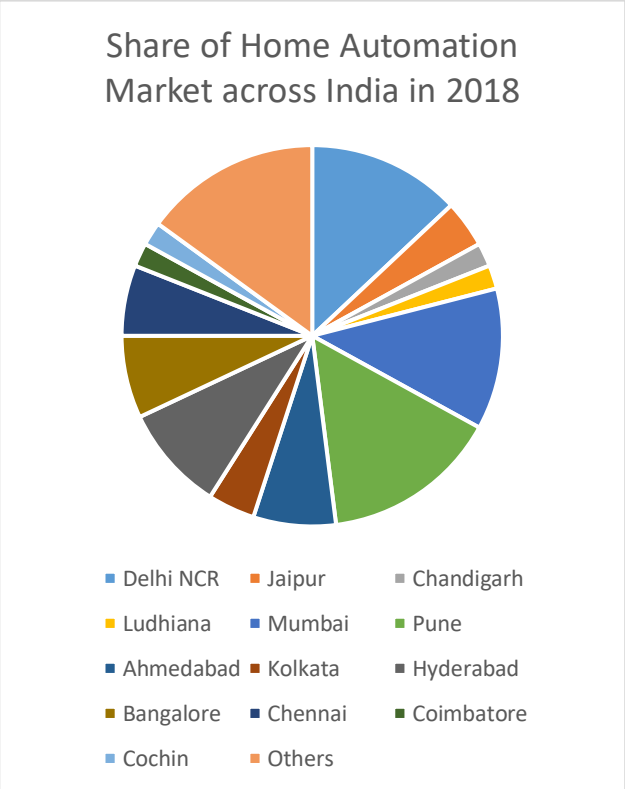


Chart 1: Share of Home Automation Market across India in 2018[13]

The following system includes automation of four such appliances viz. Motion Sensing Lights, Temperature Regulated A.C., Solar Light Tracker, Toilet Paper Dispenser. An Arduino UNO R3 board is used to perform functions according to the input and a Wi-Fi module (ESP8266) is used to connect to each appliance and the corresponding sensor.

A. Motion Sensing Lights

A PIR sensor is used for detecting any movements around the set location in the room (or throughout the room), it sends the input directly to the centralized micro-controller which commands the lights to turn on each

time a movement is detected. Further, if no movement is detected, the lights are turned off after a fixed amount of time (say 10 seconds). This can help reduce human efforts as well as turn off lights and save energy whenever not needed.

B. Temperature Regulated A.C.

A temperature sensor (TMP 36) is used to sense the room temperature which is sent to the centralized micro-controller. If the temperature is above the threshold temperature which is set by the user, then the A.C. is turned on to reduce the temperature. Once the desired value is achieved, the A.C. can be turned off. This can help in saving a good amount of energy and be as efficient as ever.

C. Solar Light Tracker

It is a Solar Panel which can be turned towards the direction where intensity of light is maximum. It uses Light dependent resistors attached on 4 sides of the panel which senses the light intensity from each side. It sends the corresponding values to the micro-controller connected to the appliance via wires. The controller then evaluates the direction with maximum intensity and turns the panel using servo motors. This can be used to store maximum energy throughout the day and then use it efficiently. This setup is to be installed on the roof of a house.

D. Toilet Paper Dispenser

This appliance uses a PIR sensor to detect movement of hand around the range of detection. If motion is detected than the dispenser rotates for a limited time for e.g. 2 seconds. By this, paper is dispensed and can be used. This can help in hands free use, thus can be installed in homes as well as public restrooms.

II. Literature Survey

As per the survey conducted there exists many systems in close resemblance with the proposed system. Many documented companies are providing systems which perform the task of home automation. Each system has its features and limitations. the subsequent models describe the work been performed by the system developed by others.

N. Sriskanthan proposed the model for home automation using Bluetooth but the system has the restrictions because it is not supported within the mobile operations.[10]

Muhammad Izhar Ramli designed a prototype device system using the online application. He developed a server with auto restart if the server condition is currently down the user receives an error message.[11]

Imran has developed and designed a system known as telephone and PIC remote-controlled device for controlling the devices pin check algorithm has been introduced where it had been with cable network but not wireless communication.[12]

An application is developed by Amul Jadhav during a universal XML format which may be easily ported to the other mobile devices instead of targeting one platform. Each of these systems has their own unique features and on comparison to a minimum of each other lacks some advancement.

III. Features of ARDUINO UNO R3

Arduino UNO R3 is the board used in the proposed system. Arduino uses ATmega328P as its brain. Arduino board has 14 digital I/O pins along with 4 serial ports, a 16 MHz crystal oscillator, a power jack, a USB connection, an ICSP header, and a reset button. The power supply to the Arduino board can be provided by using a USB cable or by using the AC to DC adapter with the help of battery. Program is uploaded on the Arduino board using the Arduino Software IDE. An Arduino board has 256 KB of flash memory for code storage, 4KB of EEPROM and 8KB of SRAM which plays the major role in proper functioning of the board. It provides the platform and large set of functionalities which are user friendly even for a novice. And hence is most widely used for digital as well as mechanical automation processes.

Fig 1: Arduino UNO R3

IV. Proposed System Architecture

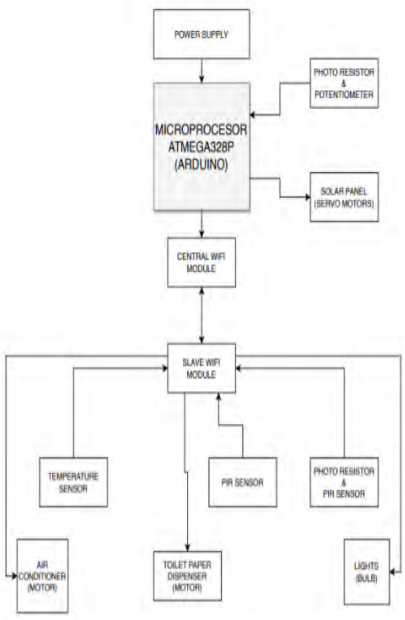


Fig 2: Architecture/Block Diagram

V. FUNCTIONAL OVERVIEW

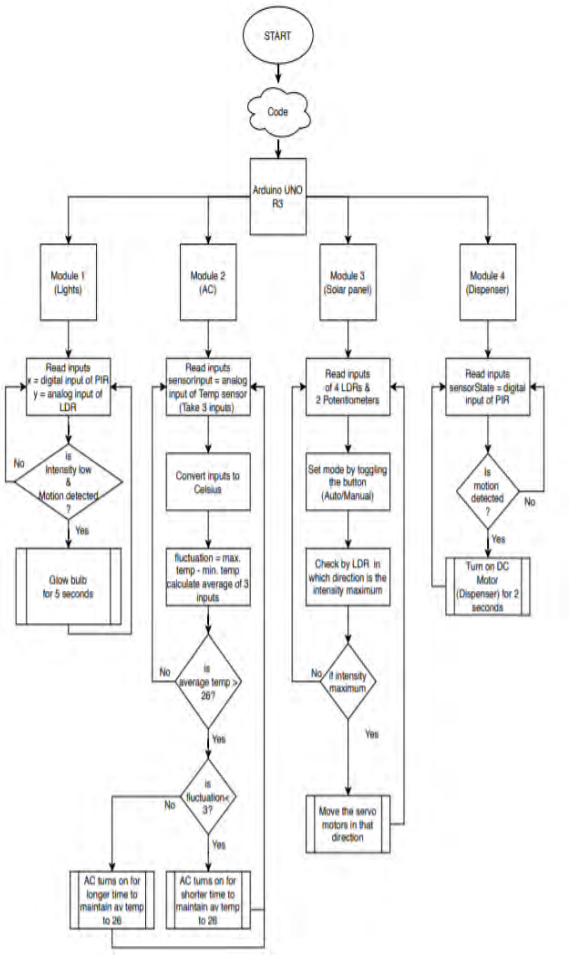


Fig 3: Functional overview

VI. DEVELOPMENT TOOLS

A. SOFTWARES USED: -

I. TinkerCAD: -Used for simulation. It is a very user-friendly platform to perform simulations. Based on Arduino, this software can be used to make circuits with a wide variety.

Fig 4: TinkerCAD

II. RemoteXY: -Can be used to make apps to directly control Arduino. It can be used to the values on terminals as desired, thereby getting the desired output.

Fig 5: RemoteXY

Arduino IDE to be used while practical implementation. Also, software's like MIT app inventor, can be used for making android apps at ease.

B. HARDWARES USED: -

I. Arduino UNO R3: -Used for controlling the system, can be programmed according to the need. Used to receive inputs from sensors and send corresponding output to the actuators. Usually forms an embedded system.

II. LDRs/Photo resistor: -It is used to sense the intensity of light that falls on it. The greater the amount of intensity the smaller the resistance. It can be used to determine the direction in which light intensity is maximum.

Fig 6: Photo resistor

III. PIR sensor: -It is a digital motion sensor which provides a HIGH output on detection of motion and a LOW output when no motion is detected. It has a 120-degree detecting angle.

Fig 7: PIR sensor

IV. TMP 36(Temperature sensor): -It is a temperature sensor which can read the room temperature and give a corresponding analog output.

Fig 8: TMP 36

V. Potentiometer: -It can be termed as a three-terminal resistor which includes a sliding or rotating arm/contact which can be used to alter the resistance between the terminals and results in a potential divider. If only two terminals are used, it acts as a rheostat. It can be used to change resistance in a circuit.

VI. ESP8266(Wi-Fi module): -It is a low-cost Wi-Fi module of the ESP family. It can be used to

control projects, by providing a LAN interface. It consists of a microcontroller and 1MB flash allowing it to connect to a Wi-Fi network. It uses the TCP/IP protocol to communicate via Wi-Fi signals.

Fig 9: ESP8266 Wi-Fi module

VII. DC motors: -It is a device which converts any kind of mechanical energy to electric energy or vice versa provided with the appropriate hardware. Mainly DC motors are of two broad types brushed and brush less DC motors. All kind of DC motors have internal mechanism which is consist of two magnets in between at the center rotary coiled stator exist when electricity passed through the coil it generates electromagnetic force which rotates the stator and commutator which provide electricity to the stator via gravity brush in a brushed DC motor.

VIII. Servo motor: -Servo refers to a error detecting response control which is integrated to correct the execution of a system. But it requires a generally advanced controller, often a fixed system module designed choosy to be used with servomotors. Servo motors refers to DC motors that vacate exactness control of the position. The servo motors generally have a revolution cutoff which span starting 90° to 180°, some of servo motors even have revolution cutoff of 360° or more. But servo motors do not rotate constantly. Their rotation is roomy between the predetermined angles.

Fig 10: Servo motor

IX. Bulb/LED: -These are used to provide output by emitting light. Typical LED can handle a current of 10 to 30 mA. This can be used for indicating a phase in a process. A bulb is used solely for output in a room. In the proposed system a bulb is used, in practical application a tube light or any light source can be used as per user requirements.

X. Relay: -A relay is an electromagnetically operated switch or an electromechanical switch. A relatively small current is used to create a magnetic field in a coil within a magnetic core and this is used to operate a switch that can control a much larger current.

Fig 11: Relay

VII. Implementation

A. Wi-Fi connection

Each of the four modules is connected to the centralized Arduino board via Wi-Fi-module i.e. ESP8266.

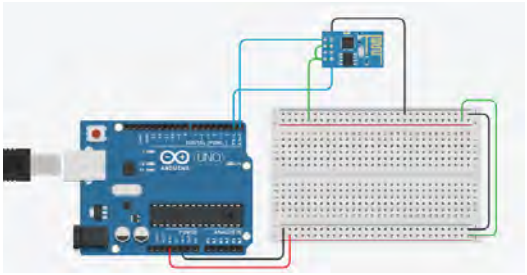


Fig 12: Connection between Arduino and ESP8266

The modules are as follows: -

1. Motion Sensing Lights -

Automatic Room Lights System/Motion Sensing Lights using Arduino is a very useful project as you need not worry about turning on and o± the switches every time you want to turn on the lights. The main components of the Automatic Room Lights project are Arduino UNO

PIR Sensor and a Relay Module and a LDR. Considering all the components used in this project, the PIR Sensor is the one that act as it is the main device that helps in detecting of motion inside a house or a room.The Sensor works by detecting the infrared rays. Whenever the human body comes near motion sensor so as the human body emits infrared rays, the motion sensor detects this infrared ray, and it gives us a HIGH signal though the output pin.

This HIGH signal is read by the Arduino. So, if Arduino reads a HIGH signal, it will give a HIGH signal to the relay module which means that the relay will get turned on and as a result the lights of the room will start glowing and the counter will be set to 1 and if some more person comes inside the rom it will increase the counter according to the number of persons inside the room. Similarly, if the Arduino reads a LOW signal, it will make the relay pin LOW and as a result the light bulb will remain low and then the counter will get reset to 0, and if there are many people inside a room the lights will get switched off only when there is no one inside the room. The LDR is used for detecting the intensity of the light inside the room, if the light intensity is below the selected and saved threshold value only then lights are switched on. This part of the LDR is used for the detection of day and night, so that the lights can be switched on and off with minimal loss of energy thereby reducing the electricity cost and maximizing the

efficiency of the product. The Automatic Room Lights project can be the best applications of the PIR Sensor.

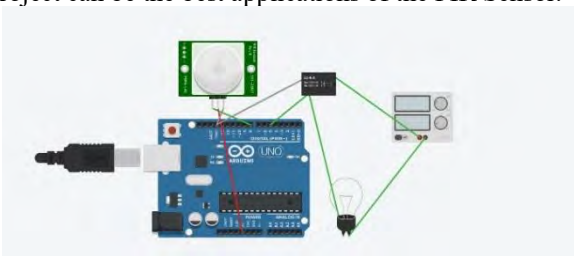


Fig 13: Motion Sensing Lights

2. Temperature Regulated AC –

This project is can reduce the power consumption as much as possible by automatically changing the air-conditioning temperature according to the room temperature. By periodically changing the set temperature, we can make the air conditioner work at a lower temperature value for a long time, so that it consumes less power.

Most of us will encounter such a situation: we must change the set temperature of the air conditioner to different values at different times of the day to always keep us comfortable. To automate this process, this project uses a temperature sensor (TMP 36) to read the current temperature of the room. The sensor reads three values at a definite interval and records each value. Based on these values, it will send an instruction to the Arduino and then the Arduino will process the information sent by the sensor and use the threshold value set by the user. Then the Arduino would send the instructions to the relay if the average of the three temperatures measured is lower than the threshold value and it will switch on the ac as the input on the relay will be HIGH. And it will then automatically get switched off when the next recorded average temperature comes to the optimal value set by the user and the value on the relay will be set to LOW. If temperature gets higher ac will be switched on again by continuing the same loop.

This process is the best way for reducing the power usage and maintaining the comfort level for the user.

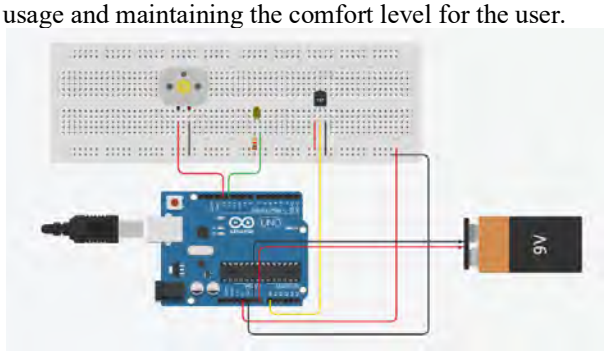


Fig 14: Temperature Regulated AC

3. Solar Light Tracker –

LDRs can be used as light sensors. Two servo motors are fixed to the structure containing a single joint with multiple gears which holds and moves the solar panel in dual axis direction. This electrical system consists of the 4 LDRs which provide feedback to a micro controller. The Arduino processes the sensor input and provides 2 PWM signals for the movement of servo motors to move in dual axis. These servo motors move the solar panel in the direction which has the highest intensity of sun light.

These LDRs are programmed to senses the amount of sunlight falling on them. Four LDRs are placed on top, bottom, left and right for accurate sensing the point of highest solar intensity in the dual axis direction.

For east-west steering and tracking of sunlight the analog values from top and bottom LDRs will get compared and if the top set of LDRs receive more light, the vertical servo will move in that direction, hence made to follow the intensity impact point.

If the bottom LDRs receive more light, the servo moves in that direction for highest point.

For angular steering, the analog values from two left LDRs and two right LDRs are compared and analyzed by the microcontroller. If the left LDR receives more intense sunlight than right, then horizontal servo will get steered in that direction, hence following the sun.

The purpose of the solar tracker is to accurately determine the position of the highest intensity of sunlight and steering the solar panel towards it. This enables the solar panels to interface to the LDR and the microcontroller to obtain the maximum solar radiation. This way we can save a lot of energy which can be used later in time of electricity scarcity.

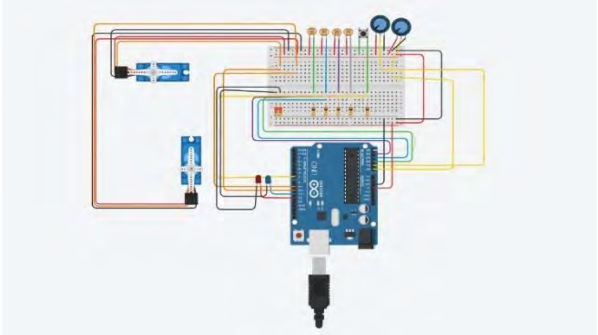


Fig 15: Solar Light Tracker

4. Toilet Paper Dispenser –

This module is fitted in a restroom for automatically dispensing toilet paper. It uses motion sensing using a PIR sensor.

It basically includes a dispenser filled with toilet paper which is locked and there is a PIR sensor attached to a screen where hand is to be moved to sense the motion.

Once motion is sensed, the sensor output is sent to the Arduino board which is a HIGH output when motion is sensed and a LOW when no motion is sensed. When there is a high input recorded in the Arduino, then the motor which is fitted in the dispenser starts rotating for a period of 2 seconds. Due to this, corresponding amount of paper comes out and the dispenser gets locked again. In this way, we can ensure cleanliness as well as save paper by not letting excess paper be wasted.

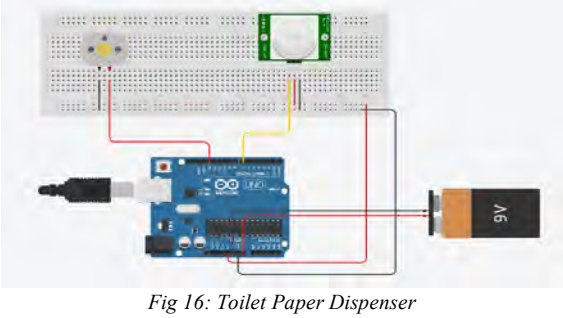


Fig 16: Toilet Paper Dispenser

VIII. Future Scope

Silicon is indeed a great material used to produce accurate sensors. But ever since the discovery of the miracle material known as "GRAPHENE". The accuracy of the sensors is increased a lot. Sensor made of graphene are more reliable and precise for the work but due to graphene's production costs people use cheaper silicon sensors at a loss of accuracy. Graphene can be used instead of silicon in making of solar panels as its light to electricity conversion rate increases by 15.23% according to a research done by University of Arkansas. And it was also not a fully purified graphene strip which was used. The unlimited potential that graphene can unlock many secrets in the fields of electronics and IOT and many other fields is far more than human understanding till now. As research is going on reduction in the costs of production of graphene humans can unlock more possibilities for specialty textiles but may also help realize a particularly utopian project – the space elevator.

IX. Conclusion

In the presented paper, a home automation system was designed and implemented and Arduino UNO R3 is used as the microcontroller which is basically termed as the centralized processing unit and can also be termed as the brain of the project as it is responsible for most of the operations and smooth functioning of the system.

The connections are made using the Wi-Fi Shield it was used as the method for the monitoring and controlling as well as functioning of the home appliances which enables the user to remotely access the system from anywhere around the home and another place outside the house as well as per the user convenience.

The system can automate the operations of the appliances by tracing and analyzing the regular usage pattern of the appliances by the user and the requirements laid down by the user for the appliances. This system does not only save a lot of human effort as a result providing them with more amount of time which is spared due to remotely handling of the appliances, they used to waste a great amount of time while performing such operations, the system also helps in conserving energy which is on the verge of extinction.

Due to its remote handling of the appliances from anywhere around the home and the user-friendly interface it is also capable of helping the differently abled person and the older people in performing basic tasks at home such as switching on/off the light, fan, and many such operations without having to depend on others to help them in performing such operations. Thus, system is about the use of automation effectively in a day-to-day life and bring the everlasting changes for humans in the positive manner.

Acknowledgement

We would Express our gratitude towards the Department of Electronics Engineering (THAKUR COLLEGE OF ENGINEERING AND TECHNOLOGY) to arrange a conference on IOT and the conference provided us the platform to represent the developed system through the technical paper.

We would like to thank our mentor Mr. Sunil Khatri (A.P., Electronics department, Thakur College of Engineering and Technology) as words fall short while expressing our gratitude towards him, he was the one who guided us at every path during our project and even while preparing our Technical paper.

References

[1] Ritvik Iyer and Antara Sharma, "IoT based Home Automation System with Pattern Recognition".

[2] Vinay Sagar K N and Kusuma S M, "Home automation using Internet of Things," in International Research Journal of Engineering and Technology (IRJET).

[3] Pavithra.D and Ranjith Balakrishnan, "IoT based monitoring and control system for home automation".

[4] Ana Marie. D Celebre, Ian Benedict A. Medina, Alec Zandrae D. Dubouzet, Adrian Neil M. Surposa, and Engr. Reggie C. Gustilo, "Home automation using RaspberryPi through Siri enabled mobile devices".

[5] Silviu Folea, Daniela Bordencea, Casiana Hotea, and Honoriu Valean, "Smart home automation system using Wi-Fi low power devices,"

[6] Rozita Teymourzadeh, Ceng, Salah Addin Ahmed, Kok Wai Chan, and Mok Vee Hoong, "Smart GSM based home automation system".

[7] Mamata Khatu, Neethu Kaimal, Pratik Jadhav, and Syedali Adnan Rizvi, "Implementation of Internet of Things for home automation".

[8] Dhakad Kunal, Dhake Tushar, Undegaonkar Pooja, Zope Vaibhav, and Vinay Lodha, "Smart home automation using IOT".

[9] Renuka P. Dhage and S.P. Kharde, "A Review on home automation system (HAS)," in International Journal of Advanced Research

[10] N.Sriskanthan, F.Tan, A.Karande, "Bluetooth based home automation system".

[11] Mohd Helmy Abd Wahab, Nabihah Ahmad, "TOWARDS SMART HOME: CONTROL ELECTRICAL DEVICES ONLINE".

[12] Dhakad Kunal, Dhake Tushar, Undegaokar Pooja, Zope Vaibhav, Vinay Lodha, "Smart Home Automation using IOT".

[13] Home Automation in India – Future trends, Problems & Solutions [Online], Available: https://www.hiotron.com/home-automation-in-india-future-trends-problem-available-solutions-of-the-market/

[14] Arduino UNO R3 board [Online], Available: https://www.indiamart.com/proddetail/arduino-uno-r3-board-16011004133.html

[15] Tinkercad Logo [Online], Available: https://www.jing.fm/iclipt/wboTbw/

IoT Enabled Smart Container

Aman Khan Pathan
Electronics Engineering
Thakur College of Engineering & Technology,
Mumbai.
amankhan.s.patham@gmail.com

Lovlesh Dagar
Electronics Engineering
Thakur College of Engineering & Technology,
Mumbai.
lovleshsingh99@gmail.com

Shivang Bhargava
Electronics Engineering
Thakur College of Engineering & Technology,
Mumbai.
shivang710@gmail.com

Vinay Chaurasiya
Electronics Engineering
Thakur College of Engineering & Technology,
Mumbai.
vinaychaurasiya2000@gmail.com

Sunil Khatri
Assistant Professor, Electronics Department
Thakur College of Engineering & Technology,
Mumbai.
sunilkhatri1919@gmail.com

***Abstract*— Ordinarily, people, lodgings and even little supermarkets face abrupt deficiency of certain fixings because of inappropriate checking. The solution proposed for this issue is through usage of the Internet of Things (IoT). The arrangement comprises a Smart Container, which is consolidated with sensors and microcontroller, which consistently screens the measure of stored items and sends information to the cloud. By this the volume can be observed. When the volume is decreased to a particular level it sends a notice to the proprietor and if the user permits, it naturally orders the particular thing from his preferred site. The information on the cloud can be accessed with an application which can be accessed by the client.**

Keywords—container, cloud, data, sensor, sensor, NodeMCU-ESP8266

I. INTRODUCTION

IoT devices have always been dependent because of its low power consumption, low maintenance, its ability to attach any network wirelessly and transmit data which might be monitored and controlled remotely. These IoT devices are accustomed to simplify your task i.e. making our workflow easier, contactless, multitasking, etc. Most of the house automation projects carry with it IoT devices and these devices are further connected to your controllable devices to manage them per your needs.

However, these automation was limited to televisions, computers, mobile phones etc. But the Smart container project is an introduction of automation to the kitchen by automatically monitoring the amount of grains in your kitchen. The full idea of the project is that the intent to ease the end-users lifestyle a touch and to encounter one in every of the foremost common problems faced by the working professionals, hotels managements and storage owners, of forgetting or being unable to test the amount of grains left periodically. This container may be utilized by folk for his or her ease. The 'smart container' is predicated on a singular technical aspects:

1. an active smart device
2. platform collecting the info, processing it, and sharing it
3. various communication protocols including those wireless communications, and
4. an Embedded sensor or set of sensors.
5.

The container will help to stay track of the quantity of an item stored within the container and provides alerts when it goes lower at a particular level. A purposely developed android application is additionally created for the benefit of users. It also allows buying items from e-portal automatically or manually. These e-portal sites can be set by the user.

II. RELATED WORK

Kavya Achary et al.[1] mentioned that the future is smart and advanced, technology will become an integral part of our life. Technology won't be limited to only TV, computers, mobile phones but it'll also overtake our kitchen. D.D. Ahir et al.[2] suggested that the concept of smart containers could be a progressive step to modernize the way we store the grains and other necessary storing items. The kitchen is equipped with many sensors which might let the user know the quantity of substance present within the container. The works associated with our paper further motivated us to figure on this technology.

K. Sakthisudhan et al.[3], proposed the Smart Kitchen Device system during which ultrasonic sensors are attached on top of the container which helps us to watch the amount of ingredients within the container[5]. The sensor senses the amount of ingredients within the container and if level goes below the edge value then distance of ingredients from top of container is notified to [10] Microcontroller then with the GSM module from which message is distributed to home-owner or manager.

Neha M.R. et al. [4] represented that a supermarket is where clients come to shop for their every day utilizing items and obtaining that. So there is a desire to work out what number of things sold and build the bill for the client. Walter Lang et al. suggested that after we go to the market for shopping, we'd like to figure on choosing the right item[9]. Subsequently, we are proposing to create a

sophisticated basket framework which will monitor bought items and online exchange for charging utilizing RFID and ZigBee[7]. There will be an incorporated framework for the proposal and online exchange. Also, likewise, there will be an RFID per user at the exit counter for unpaid goods[8].

III. Material and Work

1. Methodology

The smart container will comprise sensors, a microcontroller unit with an inbuilt wifi module, and a purposely developed application.

- step 1: The sensor fixed within the lid of the containers collects the data by processing their functions and measures the gap of the item.
- step 2: The data from these sensors is pushed into the IoT Cloud Platform called firebase cloud through the local area network with the assistance of a microcontroller which comes with an inbuilt Wi-Fi module.

1. For every container, a separate entity is created within the database.
2. The cloud stores the incoming data and performs analysis and also the result obtained from this analysis helps for further action.
3. The algorithm for the analysis is developed from investigating these incoming results.

- step 3: Then the analyzed data from the cloud platform are often visualized during a very purposely developed application.
- step 4: The user will get a notification about the amount left within the container, and at the last stage, it depends on the users to settle on whether to buy for the item or not?

2. Ultrasonic sensor

As the name indicates, ultrasonic / level sensors measure distance through the use of ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected again from the goal. Ultrasonic sensors calculate the distance to the target from time taken for the wave to bounce back and frequency of the wave. This sensor will measure the extent or depth of the grocery material within the container through calculating the time difference among the transmitted waves and the obtained waves. Here the distance is called the level or depth of the grocery item. This sensor will supply the analog voltage as the output of the sensor. The microcontroller will change over this easy voltage into computerized information. The Wi-Fi module sends those sensor data to the cloud.

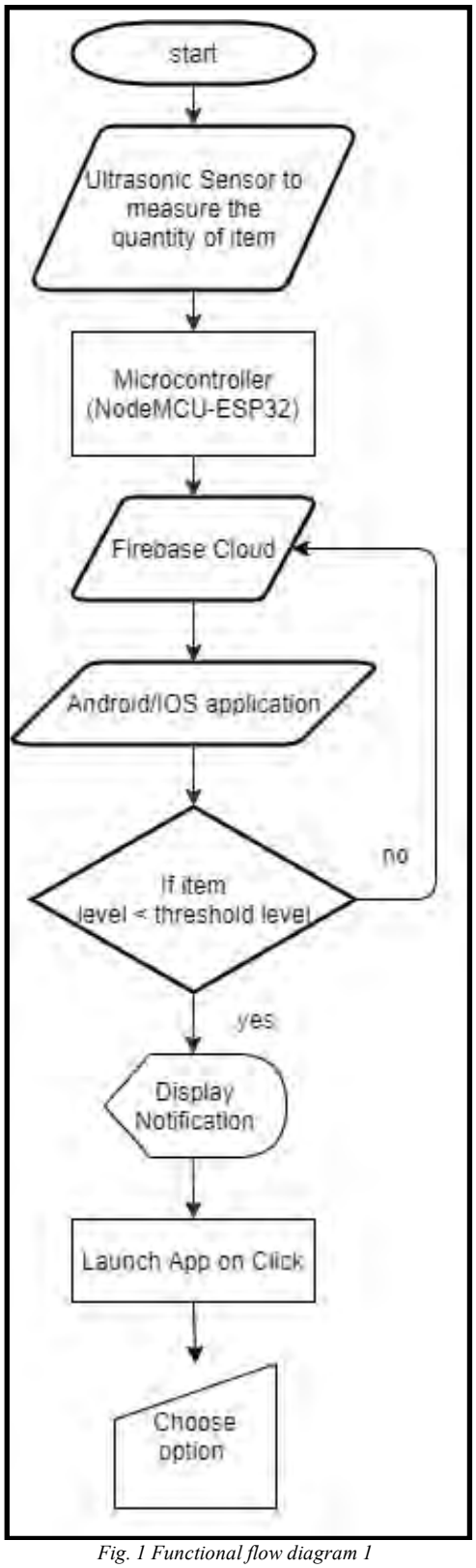


Fig. 1 Functional flow diagram 1

3. Microcontroller (NodeMCU-ESP32)

ESP32 can perform as a whole standalone system or as a slave device to a number MCU, reducing communication stack overhead on the most application processor. ESP32 can interface with other systems to produce Wi-Fi and Bluetooth functionality through its SPI / SDIO or I2C / UART interfaces. The ESP32 employs a Tensilica Xtensa LX6 microprocessor in both dual-core and single-core variations and includes built-in antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power-management modules.

4.Firebase Cloud

Firebase Cloud is simply similar to the information

storage part of the PC wherever information has persevered in multiple remote servers. This hold on information could even be accessed online. Firebase Cloud is one of the open supply clouds used for several Internet of Things applications. The data regarding the item level is held within the firebase cloud which is received by the Wi-Fi module i.e. NodeMCU. Then the item level information could even be retrieved by HTTP protocols on Android/IOS devices.

5. User Interface

After retrieving data from the firebase cloud at the back end, the results can be viewed with the help of user interfaces like Android/IOS Applications in Smart Phones.

IV. Methodology

- Step 1: The application asks for sign up on the first run.
- Step 2: The application will ask the user to enter the credentials. The signup process will create a database on the firebase cloud with UID. The same UID will be used by the microcontroller to store the item-level data.
- Step 3: After finishing the sign-up process the application will ask for a threshold level, item name, preferred e-portal.
    1. Threshold level - To send a notification to the user when reaches a level defined by the user as a threshold
    2. Item Name - To automatically search the required item on e-portal
    3. Preferred e-portal - User can select their preferred e-portal
- Step 4: The users will be asked to connect his/her device with a microcontroller using bluetooth. This process will transfer the data UID and item name to microcontroller.
- Step 5: User will be redirected to the homepage, where users will be able to track the level of item in the container.
- Step 6: As soon as the item reaches the threshold level a notification will be sent to the user's device.
- Step 7: By clicking on the notification a dialog box will appear with 3 options.
    1. By Now: This will redirect users to the preset e-portal so users can buy the same item online.
    2. Remind me later: This will ask users to select time, after which users will get the same notification and dialog box.
    3. Cancel: To cancel the further process.

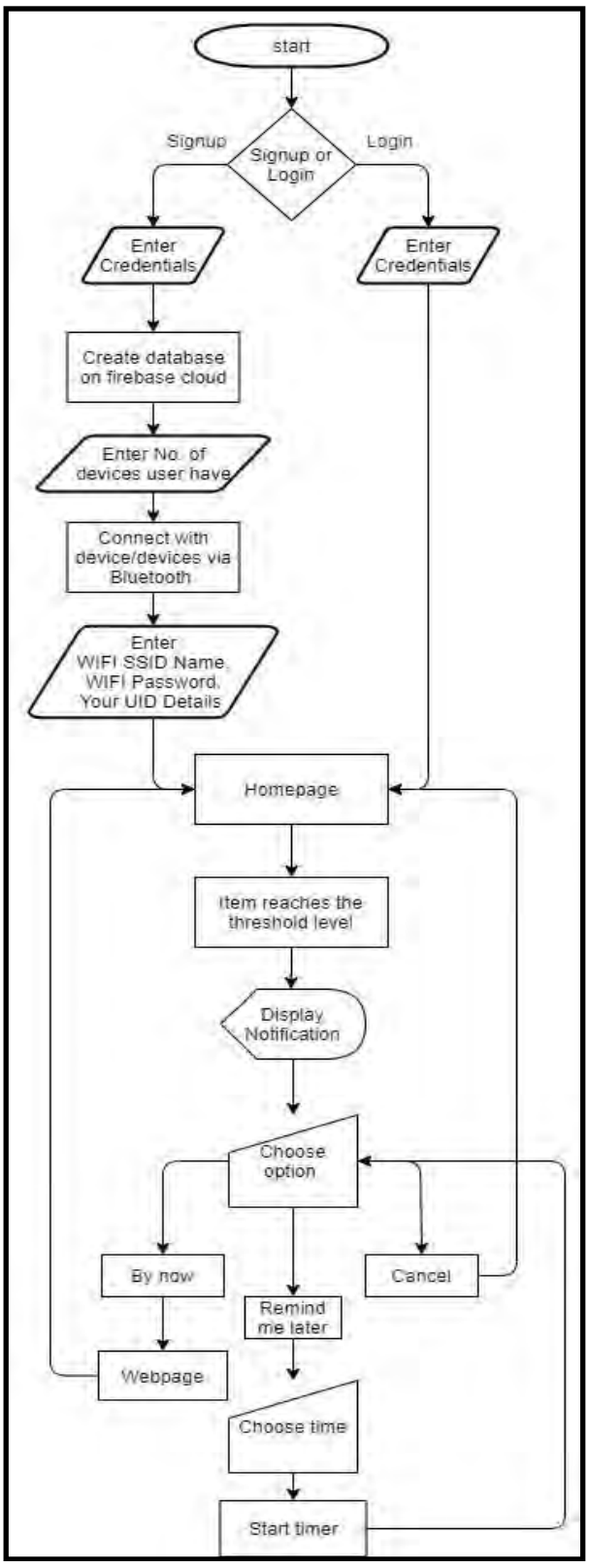


Fig. 2 Functional flow diagram 2

V. Result And Discussion

This project uses NodeMCU-ESP32 which is integrated with Ultrasonic Sensor. These components are fitted within the lid of the container. The Ultrasonic sensor will measure the level of an item by calculating the distance

between the item surface and ultrasonic sensor. Then this data will be sent to the firebase cloud through NodeMCU-ESP32. The collected grocery information is stored within the cloud platform where analysis takes place and at last viewed by Android Application.

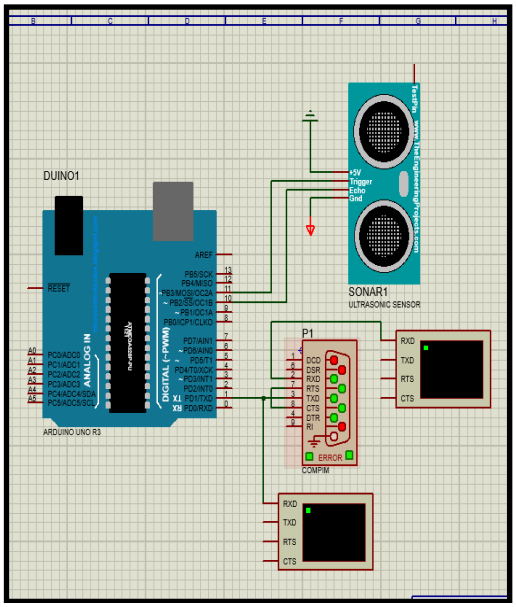


Fig. 3 Circuit Implementation

Fig. 3 shows simulation and implementation of this project on proteus software. Arduino UNO and COMPIM are used for creating a connection bridge between Ultrasonic Sensor and NodeMCU-ESP8266.

Fig. 4 NodeMCU-ESP8266

NodeMCU-ESP8266 is a microcontroller which is integrated with WIFI Module ESP8266. It creates a connection bridge between firebase cloud and proteus software.

Fig. 5 User Account on Cloud

Fig. 5 shows Firebase creates an account with UID, Email id, and Password.

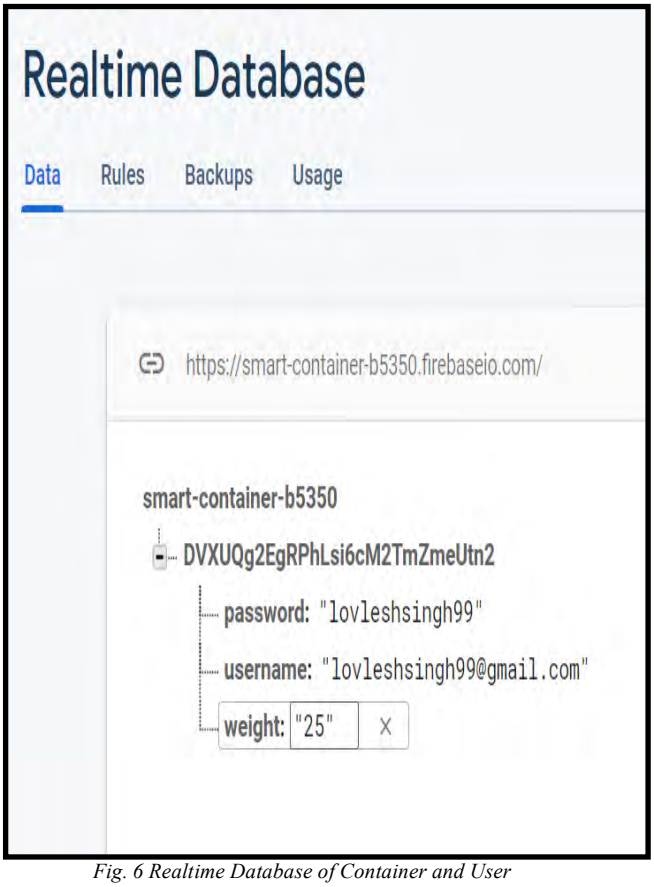


Fig. 6 Realtime Database of Container and User

In Fig. 6 the realtime database is created by android application.

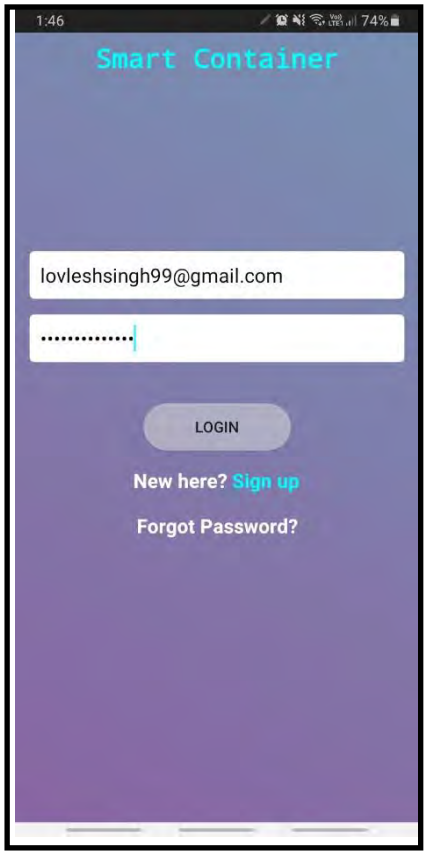


Fig. 7 Login UI

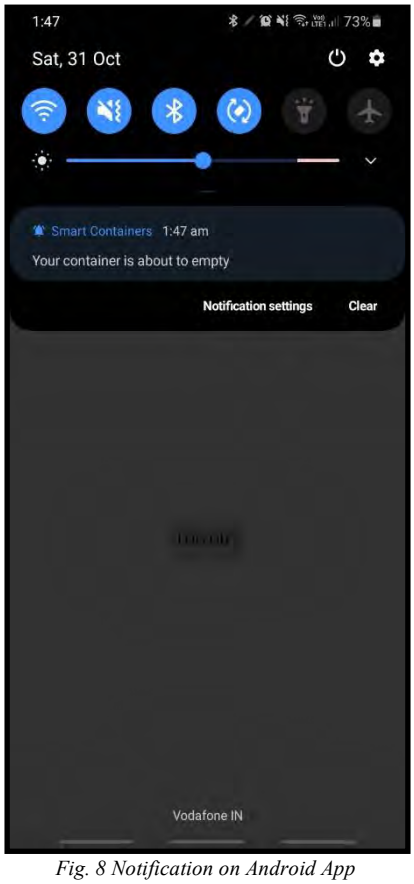


Fig. 8 Notification on Android App

Fig. 7 shows the Login page of android application, where users can login/sign-up into their account. This process will create a realtime database and account of the user with its UID, email-id and password. Forget password will allow users to reset password if the user has already created it earlier. Fig. 8 shows that the user gets notified when the container is about to empty.

VI. Future Scope

In the future, this project especially the user interface part is going to be transformed into a complicated application which can keep a record of the things within the container like if the item within the container is changed even then also it'll keep a record of all those items stored within the container in the past and can include some advance features like as follows

1) it will display the moisture within the container
2) it will display the expiry date of the actual items within the container
3) The user can look for any item in the search tab and also the app will show on which websites the actual item is obtainable
4) it will show which recipes may be prepared with the actual item with a recipe video's

For dairy products, advanced containers embedded with advanced sensors will be designed.

VII. Conclusion

IoT is the future with many sensors collecting information from the environment and analyzing and manipulating this data for the betterment of society. Regarding this product, it can become an integral part of life as we need not worry about the regular checking of stored items and physically visiting shops to buy them. It is beneficial for all from big organizations to a typical man who shares the identical problem of storing and checking of stored items. One can stop worrying about continuously checking the amount of things and removing time from your schedule to travel to the market and buy, like the assistance of data collected within the cloud the things may be preordered automatically or manually.

References

[1] Kavya Achary et al., "A Smart Kitchen Device using Ultrasonic Sensor for storage of food ingredients in mega kitchens", 2017.
[2] D.D. Ahir et al., "Smart Pantry", 2019.
[3] K. Sakthisudhan et al., "A Smart Kitchen Automation and Grocery Management System using IoT", 2019.
[4] Neha M.R. et al., "Design and Development of Smart Containers using Smart Sensors to Maintain Inventory", 2019.
[5] Fady E. F. Samann, "The Design and Implementation of Smart Trash Bin", 2007.
[6] A. Vinora, "Smart storage container for solids", 2020.
[7] Anup Aravind Lakkanagavi et al., "Smart Kitchen Containers as a Part of Smart Home Appliances Using IOT and Android", 2019.
[8] Shilan Abdullah Hassan et al., "Smart Solid Waste Monitoring and Collection System", 2016.
[9] Walter Lang et al., "What Can MEMS Do for Logistics of Food? Intelligent Container Technologies: A Review", 2016.

This page is kept blank intentionally

IoT based Weather Monitoring System

Shreya Mishra,
Department of Electronics and Telecommunication, Thakur College of Engineering and Technology, Kandivali East, Mumbai.
6901shreyamishra2001@gmail.com

Chinmay Deepak Ghodke,
Department of Information Technology, NDMVP's KBT College of Engineering, Nashik, Maharashtra.
chinmayghodke777@gmail.com

Sushma Rathod,
Master of computer application, KLS Gogte Institute of Technology Belgaum, Belgaum, Karnataka.
sushmarathod29@gmail.com

Palak Dhanpatraj Lunawat,
Master of computer application, KLS Gogte Institute of Technology Belgaum, Belgaum, Karnataka.
palaklunawat19@gmail.com

Aditya Chatterjee,
Master of computer application, KLS Gogte Institute of Technology Belgaum, Belgaum, Karnataka.
adityachat920@gmail.com

Sukruti Kaulgud,
Department of Electronics and Telecommunication, Thakur College of Engineering and Technology Kandivali East, Mumbai.
sukruti.kaulgud@thakureducation.org

***Abstract*—Internet of Things is drastically transforming the day-to-day physical objects that surround us into an ecosystem of information. Weather parameters play crucial role in a healthy living, but urban advancements leading to pollution is resulting in adverse effects on weather parameters. This paper proposes the project work in lights of real-time low-cost IoT based weather monitoring system that monitors various gases present in the local area along with the other weather parameters like temperature, humidity and light intensity and displaying the collected data via LCD monitor; thereby enabling further adequate actions to be taken. A weather monitoring system that does the air quality monitoring can prove to be very advantageous for Home Automation, Smart community, Smart cities and likewise projects.**

Keywords—IoT, Weather Monitoring, air quality, Arduino Uno, DHT11, MQ135, LDR.

I. INTRODUCTION

Climate change and pollution is a concerning issue now-a-days with issues like global warming catering the alarming facts that the world has warmed by approximately 0.85°C over the past 130 years [1]. Human activities, like the burning of fossil fuels, deforestation for agriculture and urban civilization, increasing populations, pollution are all major contributors to climate change. The low-grade air quality level which is often encountered in majority metropolitan civilizations is one major effect of this global issue. In fact, this is by-far apparently the most instant effect of climate change readily noticeable by the humans [2]. Air pollution in many over-populated cities/countries is very high for human exposure, thereby causing residents to wear face masks all year-round [3]. There is a need for regular monitoring of the weather parameter in the world that we live in so that steps can be taken by every individual person in maintaining the air around which we reside [4]. This drops a requirement of a small size weather monitoring system that can be instilled in the houses or society.

IoT not only allows human to human interaction but also enables human to device interaction and device to device interaction. This advancement aids solution for various limitations and thereby has great potential to transform various sectors such as transportation, automation, energy and weather forecasting [5]. Since the world is transforming so very quick that there should be the weather stations.

This paper aims to develop a smart, low-cost, IoT based weather monitoring system along with the advanced facility of displaying the real-time weather parameters. This weather monitoring system is based on IoT. The system is equipped with environmental sensors used for measurements at any particular surrounding and report the real-time accessed data to the user. To accomplish this, we used Arduino Mega and different environmental sensors like DHT11, MQ135, LDR. The sensed weather parameters index is displayed via LCD thereby providing the forecasting of data. The system has been proposed particularly keeping in mind the likes of building a smart society, smart city, smart community by notifying the weather updates of that particular place/locality.

II. REVIEW OF LITERATURE

In today's world, many weather and pollution monitoring systems are designed to measure different environmental parameters. In the present scenario, there are few works done in the field of Weather monitoring where there are mention of monitoring the combination of temperature, humidity in one smart solution and also have actuators to adjust these sensed weather parameters. Additionally, there is one research paper that has discussed monitoring these three environmental conditions and cloud system; however, there has been not a single mention about having actuators to modify [6]. So our main idea was to propose a system that can detect the main components that sense the weather parameters and can forecast the weather without error.

Classical weather forecasting techniques usually relied on patterns observed from events that have already occurred, also termed as pattern recognition. For instance, it could be observed that if the sky during sunset was particularly red-ish in color, the next day is often observed to have fair weather [7]. This experience

gathered over the decades to produce weather lore. However, not all of these predictions are authentic, and many of them have since been found not to stand up to rigorous statistical testing. The simplest method of forecasting the weather by far is persistence and it relies upon today's conditions to forecast tomorrow's weather conditions. This can be a plausible way of weather forecasting when it is in the steady state, such as in the tropic region, during summer season. This technique of forecasting is strongly dependent upon the presence of a constant weather pattern. It can be advantageous for both short-range as well as long-range (Lo-Ra) forecasts [8]. This paper provides a small yet effective solution of weather monitoring along with air quality monitoring as well.

III. Comparitive Study

3.1. Proposed System

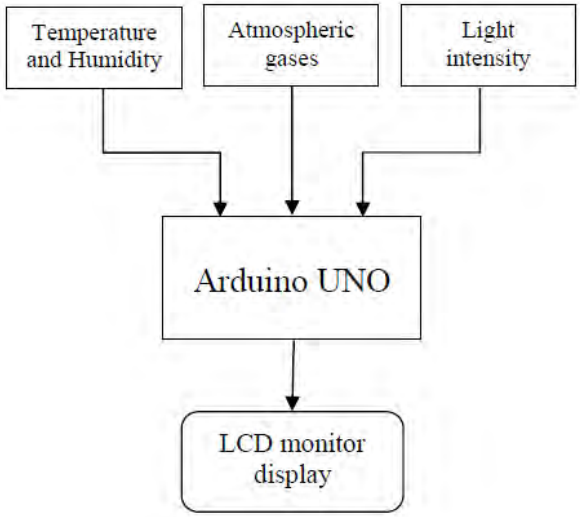


Fig. 1. Architectural Diagram of IoT WMS

The architectural model of the IoT enabled system is shown in Fig.1. The proposed IoT weather monitoring system comprise of numerous sensors, Arduino UNO and LCD monitor display. The weather parameters are sensed by sensors and data is displayed on LCD via Arduino UNO microcontroller.

3.2. Hardware Specifications

A. Sensors

a. DHT11

DHT11 has two sensors namely, a temperature senor and a humidity sensor. For temperature sensing, the senser makes use of an NTC (negative temperature coefficient) thermistor which is attached to the unit. In humidity sensor, resistive components are used to measure the relative humidity. It operates on 3.3-5.5V and operating current measuring 0.3mA with standby 60µA. It measures humidity for a wide range of 5-95% RH ±5% RH; and temperature for the range -20 - 60ºC ±2ºC. Due to its excellent sensing features involving fast-response, precise results, cost-effectiveness, less power consumption, and small make it ideal for various IoT applications.

b. MQ135

MQ135 sensor is a multi-gases detector, used to monitor the quality of surrounding air. MQ-135 alcohol sensor comprises of SnO_2-tin oxide, which has a comparatively higher ohmic resistance in clear air than in the presence of other polluting/harmful gases. The resistance of the sensor keeps on decreasing with the increase in polluting gases in the surrounding. The MQ135 sensor detects NH_2, sulfide and benzine and it is also sensitive to fumes and likewise gases. Operating voltage of MQ-135 sensor is 5V and can be used a digital as well as analog sensor. They are appropriate for detection of harmful gases like NH_3, NO_2, alcohols, aromatic compounds, sulfide, CO_2, fumes, etc. Thus, making it ideal for air quality monitoring applications.

c. LDR

Light Dependent Resistor often abbreviated as the LDR is a photo-cell which works on the photoconductivity principle. LDR, also known as the Photoresistor consists of a resistor; the value of that resistor changes depending on the intensity of light around it. LDR are available in compact dimension and are extremely cheap. Also, they consume low power (100mW) and less voltage (150V DC) for its operation making them ideal for applications involving light detection, such as the weather monitoring project.

B. Arduino UNO

Arduino UNO is a microcontroller board that depends/works on the ATmega328P microcontroller. Its specifications include 14 digital I/O(input/output) pins, where 6 pins are analog inputs, 6 are used like PWM outputs hardware serial ports (UARTs) – 4, 16 MHz crystal oscillator, a USB connection, an ICSP header, a power jack connection, as well as an RST button. Its operating voltage is 5V and has a flash memory of 32KB. This board mostly includes everything that is essential for supporting the microcontroller.

The system proposed is an advanced solution for weather monitoring that uses the above-mentioned sensors and Arduino UNO microcontroller to sense, monitor and make its real time data easily accessible via a LCD display. It is an enhanced solution that that does the Air quality monitoring along with weather monitoring. The proposed system deals with monitoring weather and along with air quality monitoring like

a) Temperature, humidity by using the DHT11 sensor,

b) Light intensity using an LDR,

c) CO2, NH3, NO2, alcohol, benzene, smoke levels in the air using MQ135.

The solution was implemented with the help of the Arduino UNO to achieve the output. Methodology of the same is explained below.

IV. Methodology

4.1. Methodology flow

The proposed weather monitoring system architecture here, comprise of three sensors namely, DHT11, MQ135

and LDR sensor. So firstly all the three sensors were connected to the Arduino UNO microcontroller, specifications of which is mentioned in the connection specification section. After the connections were done along with the coding the microcontroller, the Arduino UNO microcontroller was powered by providing external voltage for stimulation. The real time weather parameters were captured by the sensors. These data were then processor by Arduino and displayed via the LCD monitor. The results displayed are detailed fairly and aid better understanding of surrounding environment. Fig. 2. explains the process in the form of flow chart.

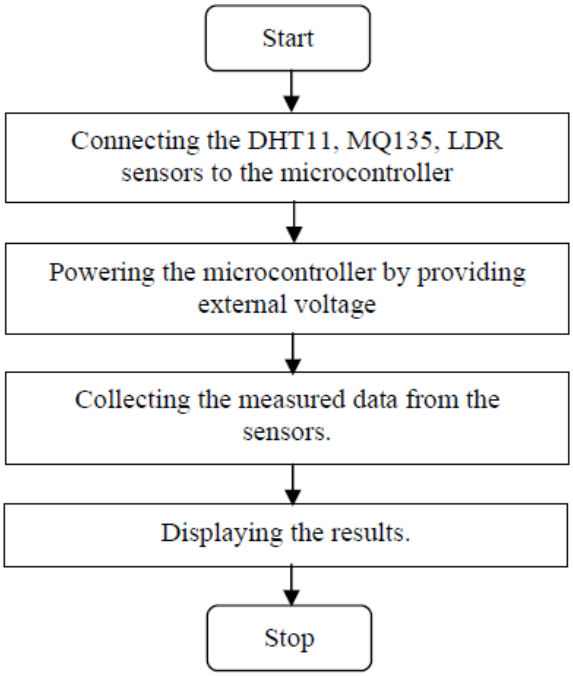


Fig. 2. Flow diagram of the process followed

4.2. Connection specifications

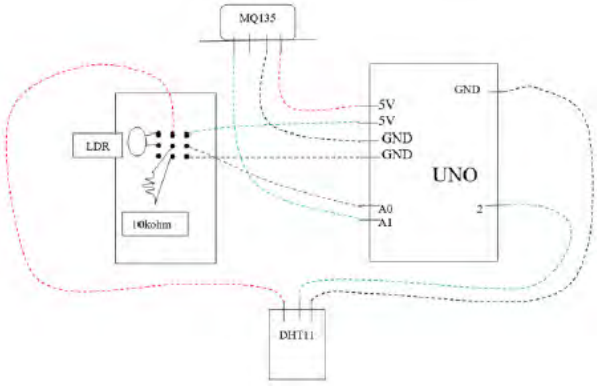


Fig. 3. Inter Connections

Fig.3 shows the inter connections of sensor with the Arduino UNO microprocessor.

1. The MQ-135 senses gases like NH3, sulfides, aromatic compounds, nitrogen, alcohols, oxygen, and smoke. The operating voltage of this MQ-135 sensor is between 2.5V - 5.0V. MQ135's Analog out pin is connected to A1 pin in Arduino Uno.
2. DHT11 is used for temperature and humidity sensing. Power supply 3.5V to 5.5V. DHT11 pin is connected to pin 2 in Arduino Uno. This gives the outputs for both Temperature and Humidity through serial Data.
3. The LDR is placed on the breadboard; the 220ohm resistor is connected to the positive(+ive) long leg of the LED.
4. Then the other leg of the resistor is connected to pin number A0 of the Arduino.

Table 1 Nodes connections

MQ135	UNO	DHT11	UNO	LDR	UNO
Ao	A1	V	5V	Leg 1	5V
G	GND	D	2	Leg2 + Rs	Ao
Vcc	5V	G	GND	Res Leg2	GND

Table. 1. Shows the pin connection of sensors with the Arduino UNO sensor nodes. Thus, the connection are made accordingly. The sensors are interfaced with Arduino UNO with the help if Arduino interface. The sensed data is processed via the microcontroller and finally the result is displayed on LCD monitor. Fig. 4. is the picture of final hardware prototyping of this IoT based Weather monitoring project.

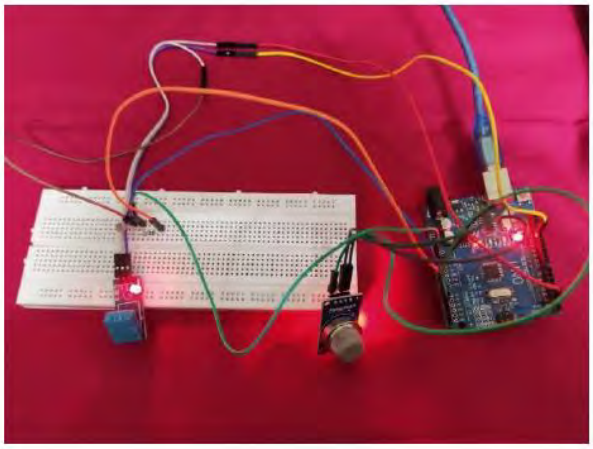


Fig. 4. Final project hardware with connections

V. RESULT

A. Weather Monitoring Results

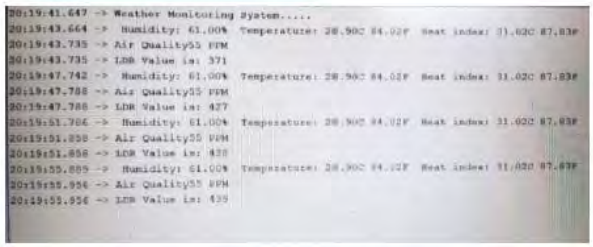


Fig. 5a

Fig. 5b

Fig 5.1. a. and b. show the results of real time sensed values of temperature index, humidity percentage, heat index, Air quality measure LDR values obtained from

DHT11, MQ135 and LDR sensor respectively. The proposed system successfully delivers the desired results.

VI. Conclusion

This paper proposed an IoT enabled weather monitoring system that integrates with the likes of air quality monitoring to provide a smart weather monitoring solution. This weather monitoring system is designed by incorporating the DHT11 sensor, MQ135 gases sensor, LDR and is powered by Arduino UNO that measures weather parameters like temperature and humidity, monitors the presence of gases such as ammonia, alcohol, benzene, smoke, gas fumes, CO2, and other harmful gases present in the atmosphere; and measures light intensity (heat index) respectively. The real-time measured data is processed, and the output is displayed on monitor screen. Thus, a low-cost weather monitoring system is developed.

VII. Future Scope

This paper presents a mini - project in the domain of weather monitoring system. One can implement a few more sensors to measure parameter like air pressure, smoke percentage, dew point, precipitation, etc. The system could also incorporate the NodeMCU ESP8266 Wifi-module to have a connect with a cloud software for storing the real-time data which can enable the access to the real-time data on the smart phone devices, resulting in better connectivity and efficiency to formulate necessary actions. Moreover, an app can also be developed, to be used by the users to view the real-time sensed weather parameters and to further generate personalized notifications via. Email/mobile pop up notification.

There is a vast scope of this IoT enabled weather monitoring system in flight, naval navigation and in military department. This IoT based weather monitoring system can be incorporated in medical institutes for the research and for the study of “Effect of Weather on Health and Diseases”. This weather monitoring system monitoring can prove to be very advantageous for Home Automation, Smart community, Smart cities and likewise projects.

VIII. Acknowledgement

Shreya, Chinmay, Sushma, Palak and Aditya would like to acknowledge discussions and guidance of Mrs. Sukruti Kaulgud. We are thankful to TCET’s National Initiative Program (Student Exchange Program) which has provided a platform in the form of NIP for Collaborative Project Development and Paper Writing on Branch specific Recent Trends.

References

[1] D. Evangelopoulos, K. Katsouyanni, H. Walton and M. Williams, Personalising the Health Impacts of Air Pollution: Interim Statistics Summary for a Selection of Statements - Oct 2019.

[2] Air Quality Standards: Environmental Protection Agency Ireland, [online] Available: https://www.epa.ie/air/quality/standards/.

[3] L. Xiaofei, Z. Mingju and W Shengjie, "Analysis of Characteristics and Impacts of China's Air Pollution Index", J. Environmental science, pp. 1936-1943, 2012.

[4] N. Kumari, Sakshi, S. Gosavi and S. S. Nagre, "Real-Time Cloud based Weather Monitoring System," 2020 2nd International Conference on Innovative Mechanisms for Industry Applications (ICIMIA), Bangalore, India, 2020, pp. 25-29, doi: 10.1109/ICIMIA48430.2020.9074848.

[5] Narasimha Swamy S, Sowmyarani C N” Repeated Data Management Framework for IoT: A Case Study on Weather Monitoring and Forecasting” 978-1-5386-3039-6/18/$31.00©2018 IEEE

[6] R. Kavin, K. Lakshmi, S. S. Rani and K. Rameshkumar, "Weather Monitoring System using Internet of Things," 2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS), Coimbatore, India, 2020, pp. 26-29, doi: 10.1109/ICACCS48705.2020.9074332.

[7] Satoh. F, Itakura. M, “Cloud-based Infrastructure for Managing and Analyzing Environmental Resources”, SRII Global Conference, pp.325- 334, 201

[8] 2. Kurschl. W, Beer W, “Combining cloud computing and wireless sensor networks”, International Conference on Information Integration and Web-based Applications and Services, pp.512-518, 2009.

Implementation of Air Monitoring System and Detection and Purification of particles present in Air using IOT

Shubham Malji
Department of Electronics EngineeringThakur College of Engineering and Technology
Mumbai, India
shubhammalji11@gmail.com

Shloka Rao
Department of Electronics EngineeringThakur College of Engineering and Technology
Mumbai, India
shlokarao28@gmail.com

Vasu Jivani
Department of Electronics EngineeringThakur College of Engineering and Technology
Mumbai, India
vasu.jivani13@gmail.com

***Abstract*— The major reason for atmosphere contamination today is because of the amalgamation of various harmful gases emerging due to factories, vehicles and from combustion of fossil fuels. The pollution management board collects information fromthousands of air observation devices which are fitted into various industries. This results in a tedious procedure for the board to stay on track of all the assorted waste levels because each business has a totally different style of waste (like Co2, CO, NH3, etc.) that must be maintained at an optimum level. In order to provide observation and management solution to industries asper their want, a sensible pollution perspective framework isprojected in this paper. This framework is often used for observing pollutants of a specific territory and to find the air property after the examination. The framework can focus onchecking air poison concentrates with the help of the internet andwireless sensor systems. The investigation of air quality is to be done by computation of air-quality index (AQI). The pollution observation tool includes microcontroller and sensors that gives the availability to observe the standard of air by detecting harmful gases present in the atmosphere, the pollution level will be monitored remotely using PCs or smartphones and the data is stored in cloud and can be accessed remotely.**

Keywords—Internet of Things (IOT), MQ Series sensors, Air Quality Index (AQI), Controlling and monitoring

I. INTRODUCTION

While technological advances have generated an improvementin human being's life quality, they have also contributed to the emergence of associated issues such as exponential industrial growth and increase of transportation networks, mainly due to a fast-growing population and its centralization into urban centers.[1] As a result, the rises of pollutant emissions towards the environmental compartments have been framed as a public health concern. Air pollution poses a serious threat worldwide. Towns and cities are choked with smog and dangerous emissions which are damaging both the environment and the health of global populations. Detection and measurement of the contents in the atmosphere are becoming increasingly important. Careful planning of measurements is imperative as well as essential. The primary purpose of a systematic air quality monitoring network is to distinguish between areas where pollutant levels violate the ambient air quality standards and areas where they don't. The secondary purpose of systematic monitoring network is to document the success of this sophisticated endeavor, either by recording the rate of progress towards attaining the ambient air quality standard or to show that the standard has been achieved. Our main focus for implementing such a system will be to monitor the varioushazardous gases at the industry level as well as monitoring the LPG at home level and also to control the same. All the monitoring and controlling will be done with the help of IOT.

An IOT system can be deployed at any location and will help in storing the measured value in our cloud database, perform pollution analysis and display the pollution level at any given location.

II. PROPOSED FRAMEWORK

The following set of Sensors/Actuators which are used in the system design are listed as follows:

1. NodeMCU
2. ADS1015 Analog Extender
3. MQ-135 Sensor
4. MQ-137 Sensor
5. MQ-5 Sensor
6. MG-811 Sensor
7. LCD screen
8. Buzzer
9. Air Ionizer
10. 4 Module Relay board

A. The sensor used for detection Benzene, alcohol, smoke is MQ-135. It has a detection range between 10-1000ppm for benzene and 10-300ppm for alcohol. It can only work in areas with humidity less than 95%.[2]

Fig.1 MQ-135 Sensor Module.[9]

B. The MQ-137 Gas sensor is used to detect the amount of ammonia in the air. It can detect ammonia from 5 – 500 ppm. A preheat period of over 24 hours is required before the senor can actually be used.[2]

Fig.2 MQ-137 Sensor Module.[9]

C. The sensor used for sensing Carbon-Dioxide (CO_2) isMG-811. It can detect CO_2 up to 10000 ppm as the gas detecting chip inside the sensor is highly sensitive to Carbon-Dioxide.[2]

Fig.3 MG-811 Sensor Module.[9]

D. To detect the amount of natural gas or smoke presentin our house we are using the MQ-5 sensor module. It can sense the gas from 100ppm to 3000ppm.[2]

Fig.4 MQ-5 Sensor Module.[9]

E. The hardware of the project comprises of NodeMCU,which uses 128kB of memory and has a storage capacity of 4Mbytes.

Fig.5 NodeMCU Board.[9]

F. For display of the values liquid crystal display (LCD)of outline size 80*36 mm is used.

Fig.6 16x2 LCD Display.[9]

G. To extend the analog pins on NodeMCU we are using an analog extender of ADS series: ADS1015. It is a 12-bit I2C compatible ADC which is being offered in an ultra-small package.

Fig.7 ADS-1015.[9]

H. To purify the presence of LPG and smoke in the house we will be using an Air Filter which is a High Output Air Ionizer or Negative Ion Generator. It works on 220V AC it purifies an area of $11m^2$ to $20m^2$ and it can purify $50m^3/h$ volume of LPG or smoke at a time.

Fig.8 Air Ionizer.[9]

I. The device used for alerting the user is a piezo-electric buzzer. It works on 2300Hz frequency and it can provide various tone to represent various levels ofalert by adjusting its frequency.

Fig.9 Buzzer.[9]

J. A relay module of 5V and 12V input voltage is used.

Fig.10 Relay Module.[9]

III. Proposed Architecture And Methodology

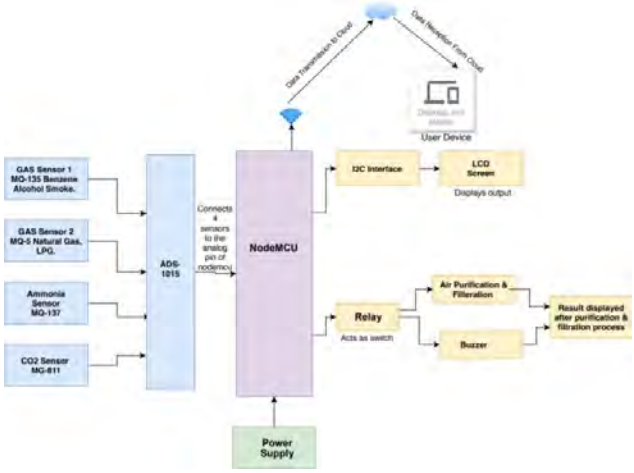


Fig.11 Block Diagram of Air monitoring, Detection,Purification and Filtration process of pollutants.

1. The Input side consists of 4 sensors i.e. MQ-135, MQ-135 MQ-5 and MG-811 which are designed to sense the amount of gas and give a reading to the NodeMCU which is Proportional to those values.
2. All those 4 sensors are interfaced to the NodeMCU via an Analog extender ADS1015 which is an I2C 12-bit ADC.
3. The NodeMCU is given power either from a Laptop or an external power supply.
4. The output side consists of an LCD and a Relay module. The LCD uses separate I2C interface in order to make its integration with NodeMCU easy. These values given tothe NodeMCU by the various sensors are displayed on a 16x2 LCD screen.[1]
5. The values sensed by the sensor are given to the CLOUD via a Wireless-Fidelity (Wi-Fi) module (which in our case is already integrated with NodeMCU board) at an interval of the choice of user.
6. When the parameter value of the sensor used to detect gas at home level exceeds threshold, the controlling device (Air Ionizer) is automatically turned ON with the help of NodeMCU.

IV. Literature Survey

Statistics obtained from the survey are summarized as follows:

- The need to maintain the air quality has fostered the demand for air quality monitors, as the polluted air contains several harmful pollutants that cause health problems. These toxic pollutants are released in air through emission from various industries, vehicles, or combustion of fossil fuels in residential areas.
- Increase in level of pollution has triggered the spread of disease such as asthma, chronic obstructive pulmonary disease, lung cancer, and cardiovascular problems among populace. The rise in awareness towards the adverse effects of polluted air on health has propelled the growth of air quality monitoring market.[4] In addition, the supportive government regulations pertaining tomonitoring and control of air pollution and increase in public–private partnership for air quality monitoring have supplemented the demand for air quality devices. However, the high prices and technical complexities of airquality monitors restrict the market growth.
- All the projects which are being used currently just focus on just monitoring of the pollutant level and sending a message on user's/concerned person's phone. After whichthe user/concerned person has to manually control the changes in the pollutant level, such as if there is an increase of a hazardous gas in an Industry then the userhas to manually turn on air purifier in order to reduce the gas and bring it back under the safety level.[5] Also, there are some systems which have limited range which cannot be expanded as per Company needs.[6]

To summarize the current scenario, we can say that at present industries have implemented system which can only sense the gas and send intimations/alert.

V. Designing Model

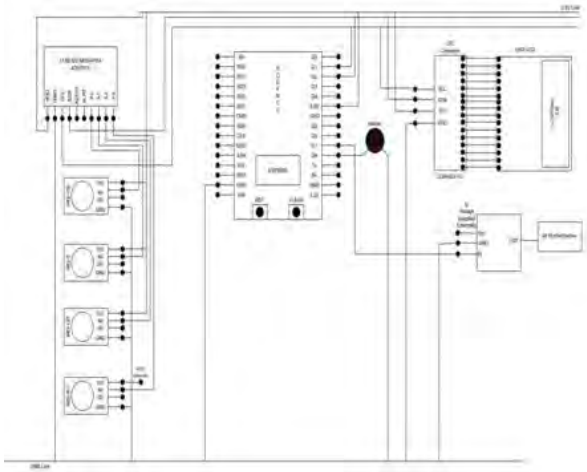


Fig.12 Diagrammatic Representation

[1] Sensing of desired parameter via sensors

YES

This process involves making use of sensors as a sensing element to sense the desired gases such as the sensor MQ137 detects mainly Ammonia, MQ135 detects gases like Benzene, alcohol, smoke, and NO2, MQ5 detects natural gases like LPG and MG811 detects CO2 as it is highly sensitive to it.

[2] Conversion of the Input signal coming from the sensors into voltage/value.

This step involves conversion of the given input signal coming from the output of 4 sensors and converting it into desired value which can be used to display on the LCD screen.

[3] Setting the Alert system ON once parameter value crosses threshold value.

In order to ensure that there is no high emission of harmful gases in industries or even there is no damage to the house, as soon as the level of gas at home or emission of harmful gases goes beyond its threshold value, the buzzer will be turned ON and an alert will be sent to the user's device.

Also, as soon as the gas level at home crosses the threshold value a signal is sent to the controlling device from NodeMCU so that the gas level can be brought down to a value below their respective threshold.

[4] Sending the Data over the CLOUD via Wi-Fi module In this process the NodeMCU will keep on sending data which is made available to it via sensors to the cloud at an interval rate which is set/defined by the user.

[5] Display of Output of the sensors on LCD screen The output of the sensor is displayed on the LCD screen sothat in case of a network issue the user can look into the LCD screen to check out the current value.

VI. Applications

A. Indoor Air Quality Measurement and Purification for Health and Safety

The health effects of indoor air pollutants can range from short-term effects like eye and throat irritation to long-term effects such as respiratory conditions, lung cancer, heart disease, stroke etc.[7] So, to avoid, what our project does is it detects pollutants indoor and purifies it to give us fresh air to breathe. This improves our health and protects us from harmful pollutants.

B. Fugitive emissions monitoring on industrial sites.

Fugitive emissions are accidental emissions of vapors or gases from pressurized apparatus, either due to faulty equipment, leakage or other unforeseen mishaps. So, to avoid this and keep it under-control, our project can measure fugitive emissions from really low concentration tohigh concentration so that we can take necessary steps to control it.[7]

C. Consultancy firms

Our project can also be used by some of the small Air Consultancy firms which cannot afford as well as accommodate big machines to do the process of Air monitoring and purification. It can give them idea about the process.

D. Ambient air monitoring.

It is the systematic, long-term assessment of pollutant levelsby measuring the quantity and types of certain pollutants in the surrounding, outdoor air.[8] We can look over long-termassessment of such pollutants and prepare charts and can make out how safe and healthy an area is looking at these charts.

VII. Results

With the implementation of the product described in this paper, the aim is to efficiently monitor the gases present anddisplay the output on the LCD screen. And if the concentration goes above, it will start its purification process to clean the surrounding air.

VIII. Future Scope

This paper very briefly scopes out how the air monitoring and purification system would make a difference at an individual as well as at an industry level. With IOT, it goes one step further and makes the management of the entire system automated which means the manual load is greatly reduced. As history has proven, we've learnt that breathing pure and chemical free air is a distant dream, and so this project very clearly is a need of the current and future times.Plus, with the evolution of the Internet, we're also able to operate the project with total ease.

Acknowledgment

Our project, 'The Implementation of air monitoring system and detection of purification of particles present in the Air using IOT' has not been done by individual students alone, but along with the guidance and assistance of our teacherand project guide Dr. S.C. Patil who has been a key factor inthe motivation and completion of the project. We are grateful to him for giving us the opportunity to create this project and guiding and supporting us in each and every way possible. We are also thankful to our parents for providingall possible resources to gain the best possible knowledge. Finally, we would thank our college 'Thakur College ofEngineering and Technology' for providing us with a platform and the necessary facilities to make this project.

References

[1] Smart Air Purifier with Air Quality Monitoring System. Dinesh Panicker, Darsh Kapoor, Bharat Thakkar, Lalit Kumar, Mahesh Kamthe. International Journal for

Research in Applied Science & Engineering Technology (IJRASET), Volume 8 Issue V May 2020, ISSN: 2321-9653

[2] Industrial Automation using Internet of Things (IOT). Ashwini Deshpande, Prajakta Pitale, Sangita Sanap. International Journal of Advanced Research in Computer Engineering & Technology (IJARCET), Volume 5 Issue 2, February 2016, ISSN: 2278 – 1323

[3] Research on an Iot Based Air Pollution Monitoring System. Vijayakumar Sajjan, Pramod Sharma. International Journal of Innovative Technology and Exploring Engineering (IJITEE), Volume-8, Issue- 9S2, July 2019, ISSN: 2278-3075

[4] Gas Leakage Detection and Prevention Kit Provision with IoT. Manaswi Sharma, Diksha Tripathi, Narendra Pratap Yadav, Parth Rastogi. International Research Journal of Engineering and Technology (IRJET), Volume: 05 Issue: 02 | Feb-2018, ISSN: 2395- 0056

[5] Air Pollution Monitoring System using Node Mcu and Air Quality Sensors. Ashwini M. S., P. Ganesh, Dwarakanath G. V. International Journal of Innovative Technology and Exploring Engineering (IJITEE), Volume-8 Issue-9, July 2019, ISSN: 2278-3075

[6] Industrial Pollution Monitoring System Using Labview And Gsm. Pravin J, Deepak Sankar A, Angeline Vijula. D. International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 2, Issue 6, June 2013, ISSN: 2278 – 8875 Page | 27

[7] Internet of things based indoor air quality improving system. Sanjay Shitole, Devika Nair, Nidhi Pandey and Heena Suhagiya. International Conference for Convergence in Technology (I2CT), November 2018, ISBN: 978-1-5386-4273-3

[8] IoT Enabled Smart Industrial Pollution Monitoring and Control System Using Raspberry Pi with BLYNK Server. S.Ramalingam, Dr. K.Baskaran, D.Kalaiarasan. International Conference on Communication and Electronics Systems (ICCES), February 2020,ISBN:978-1-7281-1

[9] https://www.google.co.in/imghp?hl=en&tab=ri&authuser=0&ogbl

This page is kept blank intentionally

Implementation of Smart Storage System

Ruchi Bhogate
Department of Electronics Engineering
Thakur College of Engineering and Technology
Mumbai, India
ruchib70@gmail.com

Atharv Deshmukh
Department of Electronics Engineering
Thakur College of Engineering and Technology
Mumbai, India
atharv5ad@gmail.com

Shivani Joshi
Department of Electronics Engineering
Thakur College of Engineering and Technology
Mumbai, India
joshi.shivani9@gmail.com

***Abstract*—In the times when automation and smart-sensing is taking over the world, the need for this technology to reach households and local businesses arises. Automatic Warehouse management is a well-known concept and has proved to be useful and efficient for managing the business. For any business or even household for that matter, managing the inventory plays a major role in the smooth functioning of the entire organization. Implementing a Smart Storage System will help with keeping a track of everything right from the stocked products to the location of that product in the storage area. The system is controlled and operated by Arduino and which gets inputs from RFID tags and antennas as well as load sensors. The RFID tags placed on each product identifies the product as unique and keeps a track of its availability. The load sensors placed on each shelf of the storage cabinet detects the out-of-stock condition and notifies the system about it. A database integrated to the system through a cloud server, collects, manages and sorts all the data of the storage unit. This is then connected to a GUI, which can be remotely accessed via the cloud server. The GUI provides the user with the information and overview of the entire storage unit with the ease of a simple click. The system not only makes storage management easy but also reduces the man-made errors.**

Keywords—Smart Inventory Management, RFID Tags and Readers, Load Sensors, Cloud-based Database, Graphical User Interface (GUI), Smart Storage

I. Introduction

While everything around us is turning towards automation and simplified operations, it was high time that there was a system equally useful for smaller businesses and the household. When it comes to a smooth flow of all the operations of any organization, be it a large-scale industry or simply our household, the availability of the required products is very important. Sometimes, even if the material is available the quantity is not enough, or the quality of the available material is degraded. At times, the location of the material is also unknown and hence it goes unnoticed. All these issues are common, and they eventually disrupt the smooth flow of operation. Our project, The Implementation of Smart Storage System, not only simplifies the whole inventory management process but also automates it with the help of a very interesting GUI application, solving all the existing issues. This project will prove as an essential tool in households and small stores where the inventory management and storage are as important as it is in warehouses. Having a system just at the touch on your mobile screens that keeps a track of everything present in your storage area along with a list for the items that are out-of-stock will save a lot of effort and eliminate the problem of products being out-of-stock. The system also helps you locate the position of the product you are searching for saving a lot of time. This whole data will be connected to a cloud server making the project and database real- time making it available from anywhere and at any hour of the day. We have combined a lot of aspects together making this Smart Storage System a full-fledged operating unit.

II. Proposed Framework

The following set of Sensors/Microprocessors which are used in the system design are listed as follows:

1. RFID Tags and Readers
2. Load Sensors
3. Arduino Mega
4. ESP8266 Wi-Fi Module
5. Logic Level Converter

A. The unique identification of every product is done by the RFID Tags attached to it and the unique ID is read by the readers placed on the shelves.

Fig. 1. RFID tags and Readers

B. The Load sensors are attached at the bottom of every rack of the shelf. They will measure the weight of every product placed on the racks.

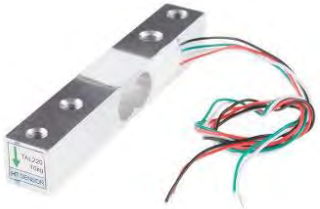


Fig.2 Load Sensor

C. The Arduino Mega is the microcontroller used for the collection and processing of all the sensor data. It converts the analog data to digital and sends it further to the cloud server.

Fig 3 Arduino Mega

D. The data from the Arduino is sent to the cloud server via a Wi-Fi Module. ESP 8266 is the Wi-Fi Module used in this project.

Fig 4 ESP8266 Wi-Fi Module

E. The Logic Level Converter is a bi-directional converter that converts 5V to 3.3V and vice-versa. It is used between the Arduino and Wi-Fi Module.

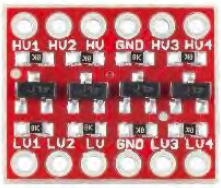


Fig.5 Logic Level Converter

III. Proposed Architecture & Methodology

In this project, Arduino's data is stored and sorted in a cloud-based database. The unique identification of the products is done by the RFID tags and readers and the weight monitoring of every product is done by the Load Sensors. This data for every product is stored in tables in the relational database. All this information is available to the user through a GUI. This GUI is available to the user on any device with internet connectivity. The block diagram of the working of this entire process is explained as follows:

Fig. 6 Block Diagram of Implementation of Smart Storage System

1. RFID Tags: The RFID tags are attached to every product. Each tag id being unique marks the product identity as unique in the database. These tags are read by the RFID reader.

2. RFID Reader: These readers pick up the signals from the tags and processes them to pass on to the antenna. These readers are attached to the sides of each shelf for maximum readability.

3. RFID Antennas: These antennas, placed on the top of the Smart Storage Unit, collect all the readings from the readers and convert them into a much understandable data. It then transmits the data to the Arduino microcontroller.

4. Load Sensors: The load sensors are connected to the base of every shelf and they give the weight of every product placed on it. The load sensors send these analog readings to the Arduino board for converting them to digital.

5. Arduino Microcontroller: The Arduino board takes the inputs from the RFID Antennas and the Load Sensors and converts it to digital data. The Arduino board can be said to act as the part of the system that manages the sensing part.

6. Logic Level Converter and Wi-Fi Module: The LLC is used to convert the 5V supply from Arduino to 3.3V. The ESP8266 Wi-Fi Module helps transfer the data from Arduino to the cloud server.

7. Cloud Server and Database: All the received data will be then sorted and stored in a relational database which will be accessed via the cloud server. It will help manage the data efficiently.

8. Cloud Server and GUI: The database created and managed on the Raspberry Pi will be available for the user through a Graphical User Interface (GUI). The GUI will be remotely accessible through a cloud server on a desktop or even mobile application.

IV. Literature Survey

Statistics obtained from the survey are summarized as follows:

1. The Warehouse Management Systems that are used in factories and for large-scale management make use of high profile, industry level microcontrollers and other devices. These are accurate and give concise results but are also expensive and cannot be used for small-scale implementation [1].

2. The inventory management systems available for smaller industries like supermarkets and garage outlets are single-purposed, meaning they are focused on giving the results of one or maximum two particular things. The available systems either just keep a track of the available or out-of-stock goods or just prepare a list of the products that need a refill in the stock. Also, these systems are again industry oriented and serve the purpose of a normal database system [2].

3. Human efforts are still needed to verify the system's output and also for maintaining the flow of the inventory in areas where the system is not working. Hence, introducing the errors from the system as well as man made errors [3].

4. Smart Storage Units or Smart Inventory Management Systems that cover almost all the aspects and makes the process of management automated are still in the prototype stage and use some outdated software and hardware components making the development process slow [4].

V. CONCLUSION

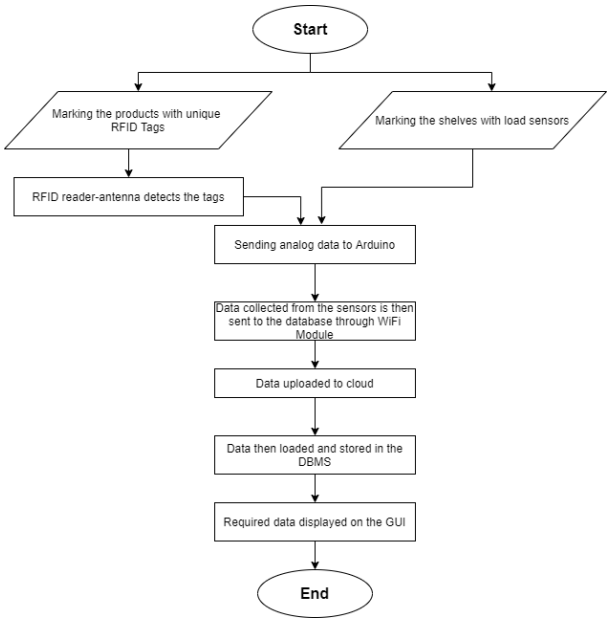


Fig. 7 Flowchart of the system

1. Marking of products with RFID and reading the signals:

The RFID Tags have a unique id for each tag. In this part we will attach a RFID Tag to every product that is being placed in the Smart Cabinet. This will mark every product unique and hence keeping a track of them will become easy. These tags transmit a signal through an integrated antenna which is then read by the RFID Readers. The readers collect this data and transfer to RFID Antennas that convert it to understandable level.

2. Marking of the shelves with Load cells:

The shelves in the Smart Storage Cabinet will be connected to Load Sensors that will keep a track of the weight of the products placed above them. The sensors give the exact weight as the output. This output will be amplified by attaching HX711 to the output of these Load Sensors before sending the data to the Arduino board.

3. *Collection and calculation of the data in Arduino:*

The analog data from the RFID antennas and the Load sensors is then converted to digital data through the Arduino. Arduino receives and controls the sensing part of the project. When the readings of the load sensors reach a minimum threshold, the Arduino alerts the system about the product going out-of-stock. The collected and converted data from the Arduino goes to the Cloud Server through the Wi-Fi Module. The data is segregated and then stored in a connected database. The whole system is then integrated into the database using the relational database tool MySQL.

4. Data sorting and storing in Database and connecting it to GUI:

The collected data after storing in the database is saved on a cloud server to be easily accessible through a remotely accessed Graphical User Interface. The GUI can be operated by the user through a desktop as well as a mobile application. The integration of created Database and GUI is done through online tools like React Native Programming, Flutter by Google, etc. The GUI will be user-friendly and will help the user have a record of the inventory with real-time.

VI. APPLICATIONS

1. Small – Medium Industries

Presently inventory management solutions exist only for warehouses or large-scale industry. Our project makes it possible to implement a scaled down version of such a system in small to medium scaled industries. It can provide them with a solution to make efficient use of available space and keep a track of their stored goods [5].

2. Local Shops

The Smart Storage System will also be beneficial for the local shop owners. As all the goods in the shop are placed manually by the owner, managing and keeping track of the product becomes a tedious task. Our project will assist the shop owners in managing their business by helping them keep track of their products with the help of an easy interface [6].

3. Kitchen Storage

A kitchen is one ideal place where automation at various levels can be done. Daily activities include stocking the kitchen cabinet in relation to the requirement. The usual difficulty in a kitchen during cooking is finding the items to be out of stock. To avoid all such problems Smart Storage System can be used to meet all the requirements of the user [7].

4. Pharmaceutical Enterprises

Traditional storage methods involve a lot of human effort giving rise to various discrepancies. Inefficient use of available storage space is also a very common issue. Hence, keeping a track of the stored items becomes a tedious task. The Smart Storage System involves minimum to no human effort. With being user friendly our system also is very self-sufficient. The system is useful in storing all the products systematically reducing the manual effort [8].

VII. RESULTS

With the implementation of the system described in this paper, the aim is to efficiently manage and monitor the storage areas. This system will make inventory management easier and real-time. The user will have quick and easy access to the data, the data being updated constantly.

VIII. FUTURE SCOPE

An efficient and easily manageable inventory and storage system is needed by anyone who is in charge of managing even a small inventory like that of our kitchen. The Implementation of Smart Storage System will come in handy to all such managers starting from small hotels to even local supermarkets. This project can also be implemented in libraries making it easier to manage and keep a track of all the books that are returned, missing or available. A kitchen of any house is a very common area where inventory management is extremely important and is often not managed as required. Our system can efficiently work in such areas making it really easy to manage and keep a track of all the necessary products. While this project covers almost all the aspects of

automation and keeping an intact database, a few improvements can be made in the automation and robotics part. The system can be further improved to automatically store the newly bought product in its correct position and hence update the database. It can also be improved to retrieve the required product from its position in the storage area to the user just by the click of a button. All in all, the project while taking care of the necessary areas also leaves a scope for better improvement of the same.

ACKNOWLEDGEMENT

This project cannot be entirely created by an individual. The timely completion of the project 'Implementation of Smart Storage System' has been possible because of our teacher and project guide Dr S.C. Patil (Electronics Department, HOD) who provided us with guidance and motivation throughout its making. We thank him for giving us an opportunity to create this project. We are also thankful to our parents for providing all possible resources to gain the best possible knowledge. Finally, we would thank our college 'Thakur College of Engineering and Technology' for providing us with a platform and the necessary facilities to make this project.

REFERENCES

[1] Hassan, A., Abdul Rahman, M. S., Md Shah, W., Othman, M. F. I., & amp;amp; Mansourkiaie, F. (2020). Internet of Things based Smart Shelves Prototype Implementation. JOURNAL OF ADVANCED COMPUTING TECHNOLOGY AND APPLICATION (JACTA), 2(1), 21-26.

[2] Khan, Muhammad & Shahid, Muhammad & Mansoor, Hassan & Shafique, Uzair & Khan, Muhammad Burhan & Khan, Asim-Ur-Rehman. (2019). IoT based Grocery Management System: Smart Refrigerator and Smart Cabinet. 1-5. 10.1109/SysCoBIoTS48768.2019.9028031

[3] G. A. Kumbhakarna and R. P. Chaudhari, "RFID basedlab inventory management system," 2017 International Conference on Information, Communication, Instrumentation and Control (ICICIC), Indore, 2017, pp. 1-3, doi: 10.1109/ICOMICON.2017.8279154.

[4] E. Fetrina, E. Rustamaji, T. Nuraeni and Y. Durrachman, "Inventory management information system development at BPRTIK KEMKOMINFO Jakarta," 2017 5th International Conference on Cyber and IT Service Management (CITSM), Denpasar, 2017, pp. 1-4, doi: 10.1109/CITSM.2017.8089303.

[5] A. C. Polycarpou, T. Samaras and J. N. Sahalos, "An RFID-based library management system using smart cabinets: A pilot project," The 8th European Conference on Antennas and Propagation (EuCAP 2014), The Hague, 2014, pp. 2954-2955, doi: 10.1109/EuCAP.2014.6902447.

[6] A. D'Alessandro, A. Buffi, P. Nepa and G. Isola, RFID-Based Smart Shelving Storage Systems, 2012 Asia Pacific Microwave Conference Proceedings, Kaohsiung, 2012, pp. 1034-1036, doi: 10.1109/APMC.2012.6421816.

[7] C. R. Medeiros, C. C. Serra, C. A. Fernandes and J. R. Costa, UHF RFID cabinet," 2011 IEEE International Symposium on Antennas and Propagation (APSURSI), Spokane, WA, 2011, pp. 1429- 1432, doi: 10.1109/APS.2011.5996561.

[8] D. Qiao and C. Xin, The Design of Self-Help Cabinet Based on ModBus Communication Protocol, 2018 International Conference on Smart Grid and Electrical Automation (ICSGEA), Changsha, 2018, pp. 373-377, doi: 10.1109/ICSGEA.2018.00099.

Holographic AR Simulation for Healthcare System

Pratik Malviya
Department of Electronics EngineeringThakur College of Engineering and Technology
Mumbai, India
pratiksureshmalviya@gmail.com

Ashish Yadav
Department of Electronics EngineeringThakur College of Engineering and Technology
Mumbai, India
yashish1408@gmail.com

Bhavin Patel
Department of Electronics Engineering Thakur College of Engineering and Technology
Mumbai, India
bhavinpatel4136@gmail.com

Rohan Sonar
Department of Electronics EngineeringThakur College of Engineering and Technology
Mumbai, India
rohansonar74@gmail.com

Hemant Kasturiwale
Department of Electronics EngineeringThakur College of Engineering and Technology
Mumbai, India
hemant.kasturiwale@thakureducation.org

***Abstract*— AR holographic projection has the ability to give us a more elaborative prospective and information. Healthcare system can have a single interface for the various equipment's involved in monitoring. It can facilitate the medical students in their learning process of human body, organs and surgical operations. Overall, it can help to reduce the cost and time in healthcare and act as an effective aid in solving problems in health industry.**

Keywords— AR, holographic, projection, healthcare, simulation

I. Introduction

Our World has experienced lot of evolution in the technology but still its incorporation is left to be done. Use of AR holographic technology in dealing with our problems is one such effort to redefine both the way we deal with our problems & use of such technology. In healthcare monitoring system to have better and detailed information of patient in a single window.AR can serve as a demonstration tool to teach surgery and treatment of patients to medical students. In video consulting operation, it can give a realistic view of surgery to the doctors involved. To make healthcare monitoring advance, elaborative and visually aesthetic. Creating 3D digital model of body part and organs to improve diagnosis and treatment.

II. Literature Survey

To develop a designing an interactive interface for augmented reality for smart manufacturing. Seeing the flexibility AR provides in redesigning the information provided by simulating it into the real time movement, at the same time it can be better use to modify and simulate the progress again.[1]. As augmented reality bring a computer-generated image and superimposed it into user's vision of the real-world giving additional information to the user it has a wide range of application in medical industry. Its ability to enhance the user view in the form of photo image, 3-D rendered models or have a shaded notification [2]. Augmented Reality being have the capability to display a large array of information to detail and have an interactive experience to the user. Such an advance display of the information can be used in our healthcare monitoring system to bring up all the analysis of the monitoring data of the devices in a single panel and would help doctor for better diagnosis and treatment of the patient [3]

III. Research Gaps

The concepts of paper [1] can be modified an applied to develop such an interface for healthcare monitoring devices wherein we can have a set of tools and libraries define into our interface for the same. And also, conclusion to paper [2], it could be design to serve as a tool to brief the medical students and consulting doctors regarding critical operation. Also, all the technical problems involved in the AR system discussed by the author gave us a good idea for the difficulties we might face in this project. Here one of the applications of AR technology discussed for interventive AR system, used for guiding surgeons in executing surgery could serve as a future scope of our project. And also, to add to paper [3], as this information is interactive, we can have a prediction tool for each monitoring device's data seeing the past trends of the patients, designed with the help of the doctors.

IV. Problem Definition

We were able to identify three problem statements 1. Development of the AR content for healthcare system and providing a suitable interface for addition of such content. 2. Implementation of the holographic projection system and having it to be displayed via

screen(lenses). 3.. Integration of the simulation on AR and holographic projection system. 4. Using AR in holographic devices, doctors can have their diagnosis decided in more precise way and the best treatment could be provided to patient. 5. Medical students will be benefited the most as using AR holographic device with a motion controller can get an experience on how surgeries and operation is to be carried out and can increase their efficiency in learning by 30%-40%. 6. All the monitoring devices with help of IoT devices can share their monitoring data in a single interface design for them under the sperate window integrated in an application and also live video surveillance of operations will be available to senior doctors remotely.

V. Proposed Methodology

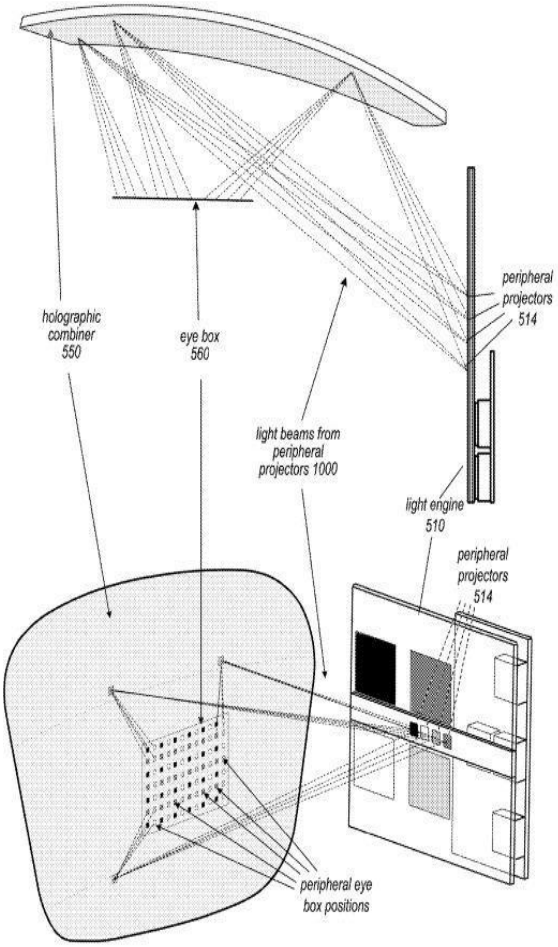


Fig 1. Holographic Combiner

To tackle our first problem for development of AR content we have come across various AR SDKs like ARCore by Google, Vuforia, ARKit and ARToolKit. We have to look upon which will be best suitable according to our needs and then decide. For second problem, about holographic projection we need a holographic projector and for displaying it we need lens. We have come across in market there are hologram system readily available but to integrate the AR content and hologram system we would need a raspberry pi board as well. To answer our third problem statement, we would need to have a simulation software integration specific for AR content, for this by talking to the faculty expert in the field we came across Simlab.

For the fourth problem using AR in holographic devices, doctors can have their diagnosis decided in more precise way and the best treatment could be provided to patient.

Fig 2. Holographic AR Doctor Briefing

And for fifth problem medical students will be benefited the most as using AR holographic device with a motion controller can get an experience on how surgeries and operation is to be carried out and can increase their efficiency in learning by 30%-40%.

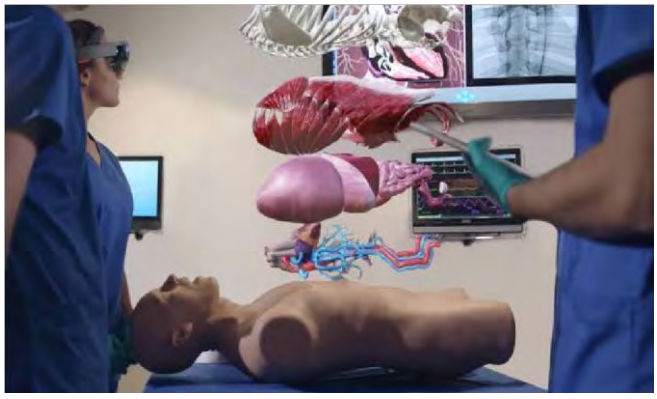


Fig 3. Demonstration of organs to medical students using AR headset.

And lastly for sixth problem all the monitoring devices with help of IoT devices can share their monitoring data in a single interface design for them under the sperate window integrated in an application and also live video surveillance of operations will be available to senior doctors remotely.

Fig 4. Monitoring of patient done using AR headset

Have decided four pillars around which for innovate idea will be converted into a working prototype.

1. AR SDK development.
2. Holographic system setup.
3. Integration of all the system and features on the software application.
4. Running and developing the simulation content.

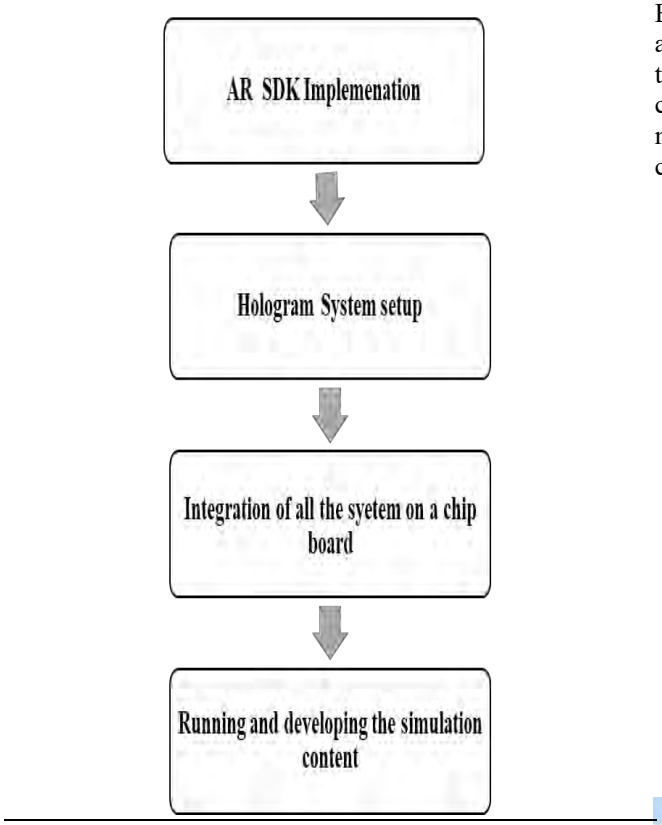


Fig 5. Action plan for implementation

VI. Expected Output

Our product will be headset having mount for a smartphone and a holographic lens attach to it. An application which will be designed for the smartphone to integrate all the features we need to provide will run visuals in such a graphical format that it will give holographic projection of the content over the lens. And also, a 3DoF or 6DoF motion controller will also be provided to connect to our smartphone wirelessly and have an interaction with the holographic content over the lens. We expect to change the monitoring system of our healthcare by integrating AR holographic representation. Redefine how surgeries and operation take place by simulating AR content along. To help in learning process of health sciences for medical students by having to show depth insight of the content by 3-D model, and holographic simulation. To serve as an aid for doctors to consult each other by have real time virtual meet using this tool. To sum up in three points how it will impact the healthcare system. As this is a device to display information digitally it won't cause any harm to our natural resources, infect it would save our natural resources which otherwise would have been used. Also, no external power would be required for our software application and computing tool required will be user's smartphone itself.

The global market size of AR and VR technology is 8.50 trillion rupees as of 2017 market research and is estimated to get a rise by 63.3% by 2025. Seeing these global market trends and owing to the local to vocal voice of our nation and supporting our Atmanirbhar Bharat movement have a huge potential in our country, as still we our yet catch the pace in this domain of the technology. It will be of huge benefit to Hospitals, clinics, medical institute, medical students and local medical practitioner which could be our potential target customers

Fig 6. Process Flow of our model

VII. Conclusion

This paper very briefly scopes out how the air monitoring and purification system would make a difference at an individual as well as at an industry level. With IOT, it goes one step further and makes the management of the entire system automated which means the manual load is greatly reduced. As history has proven, we've learnt that breathing pure and chemical free air is a distant dream, and so this project very clearly is a need of the current and future times. Plus, with the evolution of the Internet, we're also able to operate the project with total ease.

Fig 7. AR driven healthcare model

AR technology has a protentional to revolutionize the healthcare industry and bring about a different perspective towards tackling the challenges faced by our healthcare system. The monitoring of devices, learning of medical science and distance consulting between doctors can be modernize. AR can bring our thoughts and imagination into reality.As the existing devices available in the market to provide AR holography interaction are very expensive, this innovative approach in its development and use of its application in healthcare will make it financially viable to bring it into mainstream in this market and ultimately profit our organization as whole.

ACKNOWLEDGMENT

This project research wouldn't have been possible but by the guidance of our mentor "Mr. Hemant Kasturiwale" and also by one of the faculty expert in AR&VR "Mr. Tushar Roy" it was possible.

REFERENCES

[1] Yunbo Zhang,Tsz-Ho Kwok- "Design and Interaction Interface using Augmented Reality for Smart Manufacturing" , "Elsevier Manufacturing" "Vol 26, 2018, pp 1278-1286 August 2018

[2] TY - JOUR AU - Tang, S. AU - Kwoh, Chee-Keong AU - Teo, Ming-Yeong AU - Sing, Ng AU - Ling, Keck PY -998/06/01 SP 49 EP - 58 T1 - Augmented reality systems for medical applications VL - 17 DO - 10.1109/51.677169 JO - Engineering in Medicine and Biology Magazine, IEE ER.

[3] TY - JOUR AU - Ajanki, Antti AU - Billinghurst, MarkAU - Gamper, Hannes AU - Järvenpää, Toni AU - Kandemir, Melih AU - Kaski, Samuel AU - Koskela, Markus AU - Kurimo, Mikko AU - Laaksonen, Jorma AU - Puolamäki, Kai AU - Ruokolainen, Teemu AU - Tossavainen, Timo PY - 2011/06/01 SP - 161 EP - 173 T1 - An augmented reality interface to contextual information VL - 15 DO - 10.1007/s10055-010-0183-5 JO - Virtual Reality ER

A - Block, Thakur Educational Campus, Shyamnarayan Thakur Marg, Thakur Village, Kandivali (East), Mumbai - 400 101
Tel.: 022-6730 8000 / 8106 / 8107 Telefax: 022-2846 1890
Email: tcet@thakureducation.org Website: www.tcetmumbai.in www.thakureducation.org